VOL. LXXXI, No. 2070. [All Rights Reserved.] JULY 27, 1917. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage.] PRICE FOURPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C. 4 SUBSCRIPTION per annum, Postage inclusive, in Great Britain, £1 1s. 8d. Canada, £1 3s. 10d. ($5.80); to all other countries, 30s.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOUVEAU & CHEVILLET, Librairie, Etrangère, 22, Rue de la Banque.
Telegraphic Address: "Ageekay, Cent., London." A B C Code. Telephone Nos. City 997; Central 4425 (Editorial only).

MOULDED INSULATORS
Of all Descriptions.
LITHOLITE, Ltd.,
55-57, Hackney Grove, London, N.E.

SILUMINITE.
Fireproof—Non-Hygroscopic—High Resistant.
The New and Best Insulating Material having qualities and characteristics possessed by no other Insulating Material.
THE SILUMINITE INSULATOR CO., Ltd.,
The Green, Southall, Middlesex.
'Phone: Southall 59. Telegrams: "Tubes, London."

T. H. FERGUSON, PAILIN & Co., LIMITED, A. C.
SWITCHBOARDS
L. T. EDWARD ST., Nr. Openshaw, MANCHESTER. Tel: 599 Openshaw. D. C.

INSTRUMENTS, CIRCUIT-BREAKERS,
AUTO-CUT-IN & CUT-OUTS.
THE Record Electrical Co., Ltd.
BROADHEATH, MANCHESTER.
TELEPHONE: 164 ALTRINCHAM.

BROOK
Single-, Two- and Three-Phase Motors
LONDON, LEEDS and HUDDERSFIELD.
See Advertisement Sup. 58.

SWITCHGEAR.
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors,
GREENLAND PLACE, CAMDEN TOWN, LONDON.

NEW DISTRIBUTION BOXES.
THE CANTIE PATENT FUSE WILL CLEAR A "DEAD SHORT."
ALL CONNECTIONS FROM FRONT.
THE CANTIE SWITCH CO., LTD.,
67, MOUNT ST., NOTTINGHAM.

THE **SAXONIA**
ELECTRICAL WIRE CO., LTD.,
ALWAYS GREENWICH, S.E.
ALL BRITISH
FLEXIBLE CABLES.

CHURTON
SINGLE and POLYPHASE
MOTORS.
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

LIFTS and TRANSPORTERS.
Wm. WADSWORTH & SONS, LTD.,
BOLTON.

"EMPIRE"
AUTOMATIC CONTROL
FOR
Shell Presses, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW.

WESTERN-ELECTRIC
COMPANY, LIMITED,
Norfolk House, Victoria Embankment, W.C.
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement this week, Sup. 32.

CONNOLLY BROS., Ltd.,
for
WIRES AND CABLES.
See Advertisement last week, p. iii.

WIRES & CABLES.
THE
WHOLESALE ELECTRICAL CO., LTD.,
54/56, Oxford Street, London, W.
'Phone: Museum 1897.

SWITCHBOARD LABELS,
Meter Dials, Name Plates, Address and Instruction Plates, Advertising Novelties, Club Badges, Checks, Tokens, Blanks, Die Stampings, Dies, Press Tools, Punches and Cutters.
RELIANCE Engraving Co., Ltd., CHISWICK.

SEND FOR SAMPLE
NEW CHEAP BELL.
JULIUS SAX.

CABLES AND WIRES.
SWITCHBOARDS.
TRANSFORMERS.
JOHNSON & PHILLIPS, LTD.,
CHARLTON, LONDON, S.E.

Glasgow Office: 68, Gordon St.
OPENSHAW, DYNAMOS **ELECTROMOTORS, Ltd.** MOTORS MANCHESTER.
London Office: 48, Queen Victoria St., E.C.

START LIGHT.
THE
WOODHOUSE AUTOMATIC CLUTCH
PICKS UP LOAD AFTER STARTING.
THE VICTORIA DYNAMO & MOTOR CO.,
CRAVEN HOUSE, KINGSWAY, W.C. 2

MAVOR & COULSON, Ltd.,
GLASGOW.
MOTORS, DYNAMOS, SWITCHGEAR.

"WHITE STAR" LAMPS
DRAWN WIRE.
The "RUGBY" CARBON FILAMENT and RADIATOR LAMPS.
THE LONDON & RUGBY ENGINEERING CO., LTD.,
36 & 37, Queen Street, E.C. 4
Telephone: City 5252.

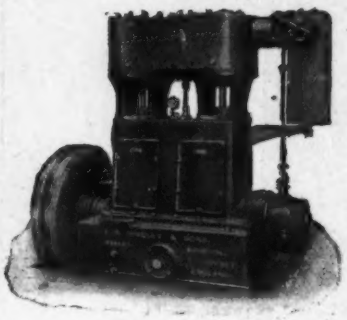
THERMIT, LIMITED,
675, COMMERCIAL ROAD,
'Phone: EAST 4157. LONDON, E. 14 Grams: "Fulmen. Step, London."
PATENT
Alumino Thermic Welding Process.

LEA RECORDERS
for measuring
Boiler Feed Water
and Condensed Steam.
The LEA RECORDER CO., Ltd., Deansgate, Manchester.

—M·E·M—
List free. MIDLAND ELEC. Mfg. CO., LTD., Barford St., B'HAM.
means greatest Design-Simplicity, embodying all known advantages, at marked moderate prices — in BRITISH
Ironclad Gear

Advertisement Index, see page xxviii.

VERTICAL HIGH SPEED ENCLOSED STEAM ENGINES.



SIMPLE and COMPOUND.

4 to 160 B.H.P.

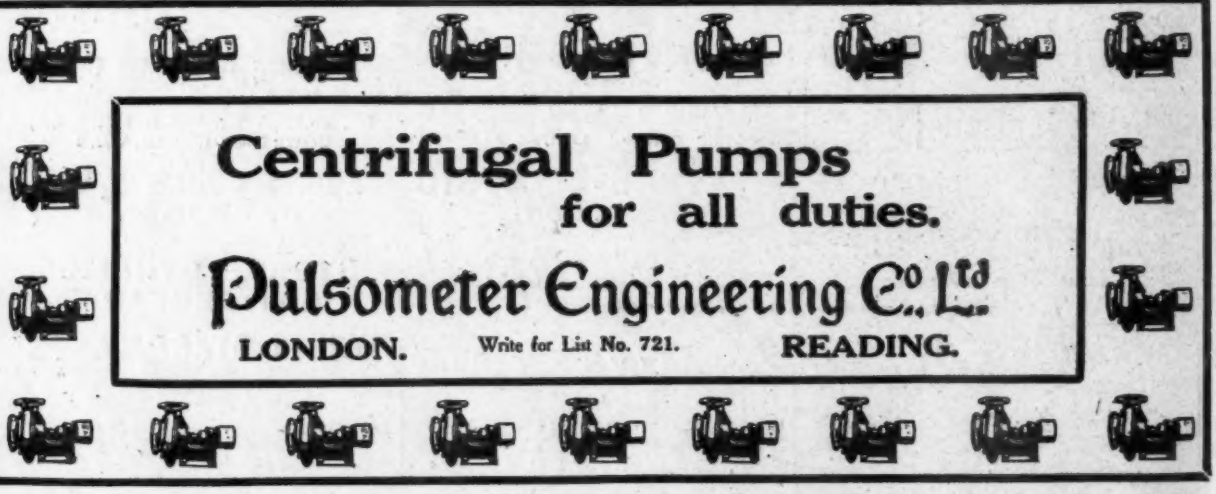
NOTE!

Substantial Construction.
Governor enclosed in Crank Case.
Convenient Oil Pressure Regulation.
Patent Duplex Reversible Strainer, can be cleaned whilst running.
Drip from Governor Valve Gland carried down through Vertical Rod to ground.

For DIRECT COUPLING TO DYNAMOS, FANS, PUMPS, Etc.
Silent Running, Economical and Reliable.
For SHIPLIGHTING and INDUSTRIAL WORKS OF ALL KINDS.
Write for further particulars.

E. S. Hindley & Sons, 11, Queen Victoria Street, LONDON, E.C.
Telephone: City 9804. Telegrams: Steampert, LONDON.
Works: BOURTON, DORSET.

Also VERTICAL GAS and OIL ENGINES.



Centrifugal Pumps for all duties.

Pulsometer Engineering Co. Ltd.
LONDON. Write for List No. 721. READING.

Buy British Made

"CHATTERTON COMPOUND"

Bull Dog Brand (Regd.).

Manufactured by
THE POMONA RUBBER COMPANY,
CITY ROAD,
MANCHESTER.
Telegrams: "Pomrub." Telephone: 376 Trafford Park.

THE

ELECTRICAL REVIEW.

VOL. LXXXI. JULY 27, 1917. No. 2,070

ELECTRICAL REVIEW.

Vol. LXXXI.] CONTENTS: July 27, 1917. [No. 2,070.

	Page
Industrial Mistrust	73
Why London?	74
Propaganda in Spain	74
Off-peak Loads	74
Electrolysers and their Management, by E. Reuss (*illus.*)	75
A Good Summer Load, by "Research"	76
Electric Cooking in the Factory (*illus.*)	77
New Electrical Devices, Fittings and Plant (*illus.*)	79
A New Industrial League	80
Legal	81
Correspondence—	
A Revelation Concerning the Ways of Reviewers	83
War Items	83
Business Notes	84
Notes	87
City Notes	90
Stocks and Shares	92
Manufacture of Synthetic Nitrates by Electric Power	93
The Marcillac Hail Net (*illus.*)	94
Underground Signalling-Bells	94
Electric Power Generation by Gas	95
Patent Law	95
New Patents Applied for, 1917	96
Abstracts of Published Specifications	96
Contractors' Column	Advertisement page xxii

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGREKAY, LONDON." Code, A B C.

Telephone Nos.: City 997; Central 4495 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, £1 1s. 8d.; Canada, £1 5s. 10d. ($5.80). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson, & Co., Gresham Street.

AUCKLAND N.Z.: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 31a, Strand Arcade, Queen Street.

BRISBANE: Gordon & Gotch, Queen St.

CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.

DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.

JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.

LAUNCESTON: Gordon & Gotch, Cimitiere Street.

MELBOURNE: The Mining & Engineering Review, 90, William Street; Gordon & Gotch, Queen Street.

MILAN: Fratelli Treves.

NEW YORK: D. Van Nostrand, 25, Park Place.

PARIS: Boyveau & Chevillet, 22, Rue de la Banque.

PERTH, W.A.: Gordon & Gotch, William Street.

ROME: Loescher & Co., Corso Umberto 1° 307.

SYDNEY: The Mining & Engineering Review, 273, George Street; Gordon and Gotch, Pitt Street.

TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.

WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

THE "ELECTRICAL REVIEW'S"

ELECTRICAL & ALLIED TRADES DIRECTORY

(THE RED BOOK),

1917 EDITION

NOW READY.

H. ALABASTER, GATEHOUSE & KEMPE,

4, Ludgate Hill, London, E.C. 4.

INDUSTRIAL MISTRUST.

IN common with all peoples at all times, we are prone to assume that our own problems of the moment are original in their character, and more far-reaching in their significance than those of any other times or other peoples. We hear much of industrial unrest and of class antagonisms, and the gravity of such unrest at the present time, as well as the importance of its removal, deserves the closest attention of all who are desirous for the welfare of the State. The Parliamentary Secretary of the Board of Trade, Mr. G. H. Roberts, M.P., has expressed the view that: "If the old disputations remain, if employers and employed are ranged in conflicting camps, the ravages of war will not be repaired, reconstruction will be impossible, and, as sure as morn follows night, so will the decline and fall of the British Empire set in."

Now, the disputations of Capital and Labour have always existed, and, unhappily, the idea of antagonism of interests, though early combated, has not been eradicated. Harrington says in his "Oceana," which was first printed in 1656: "It will be convenient in this place to speak a word to such as go about to insinuate to the nobility or gentry a fear of the people, or to the people a fear of the nobility or gentry, as if their interests were destructive to each other." He indicates that they are mutually dependent. The intervening centuries have not succeeded in eradicating the idea that employer and employed must needs be in opposition, that their interests are, in fact, "destructive to each other."

It is the more interesting, then, to hear Mr. Roberts on this point:—"I have no illusions. The interests of employer and employed will never be identical any more than the principle of nationality or the interests of buyer and seller will be identical, but up to a certain point there is a community of interest."

Setting aside any philosophical or argumentative discussion as to the point where the community of interest begins or ends, there are few who will be ready to question that, for practical purposes, Mr. Roberts's statement is sufficiently accurate. And the problem of the moment is how to obtain a fair settlement where interests differ, and a recognition of points where interests are identical.

The differences of opinion are generally to be found in regard to the division of the cake to the exclusion of a recognition of the mutual advantage of producing as large a cake as possible. The disputations have centred about the former with, too often, an acrimonious attribute which has prevented a recognition of the utility of the latter.

How, then, can a new frame of mind be brought about whereby either side may approach the problems with knowledge of and sympathy with the other's case? Clearly, as we have said many times, the most effective means is to "get together." And it has happily occurred to some practical minds to form an "Industrial League for the Improvement of Relations between Employers and Employed." It was at a meeting of this League that Mr. Roberts made the remarks we have quoted. He also said:—"The working classes are very nervous and suspicious. When you tell them of a movement such as ours they say it is only another capitalistic dodge, another device

for keeping them quiet so that the employing and possessing classes may pursue their policy of exploitation. We have to allay that suspicion. Employers have to show that they recognise the rights of the workers and that the old mean rates of wages have to pass away."

Here, it seems to us, is the crux of the problem. Industrial unrest at the present time need be no matter for surprise. It may be sufficiently explained by the tension common to us all. But industrial mistrust, though perhaps intensified by the existing rarefied atmosphere, is not a new feature. If the Industrial League and the many authorities who are earnestly working to secure harmonious co-operation can do anything to remove that mistrust, they will deserve to rank amongst the benefactors of the nation.

Why London?

Since 1914, when the outbreak of war caused what has turned out to be a prolonged diversion of the normal current of affairs, it has become a habit amongst certain societies to hold their annual meetings in London.

Why this should be so we do not know; London is not centrally situated for the majority of provincial members, its hotels and assembly rooms have been largely commandeered, and, in any case, to those who are interested in such, it can show no industrial developments such as may be found in the provinces. There is a want of cohesion amongst the visitors to a London conference, which is apt to breed disunity and lack of interest; in the result the only opportunity for mutual intercourse on the part of provincial visitors is frequently lost. This has been the case for three successive years with the Municipal Electrical Association, and we venture to suggest to the new President, Mr. S. J. Watson, that a change to some progressive electrical centre, such as Manchester or Sheffield, would be welcomed by many of the members, who would have an opportunity of seeing for themselves what they can only vaguely talk about in London.

Propaganda in Spain.

A prominent feature of the state of affairs that has prevailed in Spain during the war has been the widespreading and very characteristic work of German propagandists. It is well known that Germany has nursed Spain electrically, and by means of a very extensive organisation, very effectively for years past. Nobody knows what may be the outcome of the war in that very much disturbed country. But, whatever may be the course of events, the influence of the German agent, revealed or unrevealed, will have to be seriously reckoned with if we intend to secure a more reasonable share of electrical and engineering trade there. It is of the greatest importance that attention should be paid to this question of propaganda, whether carried on from Great Britain direct or conducted indirectly through individual joint representatives in Spain. All literature and correspondence must be prepared in Spanish, which is also the language of Mexico, and of all the States in South America, except Brazil. The study of Spanish under the circumstances should be widely cultivated, as it is indispensably necessary in order to promote our export trade with Spain and South America. Our French friends are advocating the undertaking of educational work of this nature in the commercial and high schools for the purpose of developing business with Spain, and we should not be backward in learning what is really a simple and beautiful language, which can be easily acquired, particularly by those who are acquainted with French.

Off-peak Loads.

So great and so manifest are the advantages of off-peak loads to electricity supply undertakings, that it is a matter for surprise that they have not been more assiduously sought and cultivated in the past, at any rate in this country. However, we are going to turn over a new leaf in the future—the near future, we should like to say—namely, when peace returns, and we all take a long breath and look round to see what the next job is to be. Not only shall we push on with the reform of our system of generating and distributing electrical energy, of which it stands sadly in need; we must equally accelerate the growth of the demand in directions tending to improve the load factor, not by the slow methods of evolution, but by leaps and bounds.

To this end, the experience gained in the war will prove of immense assistance; the infinite flexibility and universal applicability of electrical energy have been abundantly demonstrated, new and unexpected uses have been found for it, new industries have been created which require its services, and new conditions have arisen which will profoundly modify the progress of electricity supply. Not least amongst these factors must be numbered the developments which have taken place with regard to electrochemistry and electrometallurgy. We have already drawn attention to the rapid advance of the electric steel furnace, which has now firmly established itself in favour by merit; the electric furnace has innumerable other applications, and lends itself to designs of the most diverse characters, such as the nitrogen furnace of Mr. E. Kilburn Scott, which is dealt with elsewhere in this issue. Some of these uses, and notably the last-mentioned, are particularly welcome to station managers, as they can be arranged to fall entirely within the off-peak period, and thus enable the supplier to improve his load factor. Another opening of this kind is indicated by an engineering contributor in this issue—the driving of refrigerating plant, which is still more grateful to the heart of the supplier in that it attains its maximum demand in summer time. The supply of power to farms also possesses this merit, though in less degree. Charging the batteries of electric vehicles is going to be a very valuable aid in off-peak hours, when the manufacture of such vehicles is freed from the restrictions at present necessarily imposed upon it. The manufacture of bleaching fluid by electrolysis, which is discussed on another page, may not attain to similar dimensions, but can certainly be cultivated as an off-peak load.

Many other items could be added to the list. Our purpose, however, is not to schedule every possible example, but to draw attention "right now" to the importance of due preparation, in three particulars: (1) The education of the public to the infinite possibilities of electricity as an aid in their businesses; (2) the instruction of the staffs of electricity supply undertakings as to the requirements of their business and the opportunities which lie before them; and (3) the provision of suitable tariffs for guaranteed off-peak loads, easy to understand, and attractive by virtue of their cheapness.

It is not enough to announce that electrical energy is on sale for all purposes; steps should be taken to tell the people for what purposes it can be used, how to set about using it, what it will cost, &c. We have recently given a number of examples which show that the use of electricity does not merely lead to economy in itself (it may even happen that the energy costs more in the electrical form)—it often effects economies of labour and improvements in quality and quantity of output that are totally unexpected, and are found to be surprisingly great. Nearly all the trumps are in the hand of the electricity supplier—let him play his cards well, and he *must* win!

ELECTROLYSERS AND THEIR MANAGEMENT.

By ERNEST REUSS.

The increase of recent years in the use of electrolysers is undoubtedly due to growing confidence on the part of users, and a greater willingness on the part of men entrusted with their management to take an interest in, and learn something of, a new process.

The successful manipulation of electrolysers demands at the outset the same amount of observation and study as is called for in any other manufacturing process; a few hints as to the nature of the problems to be encountered may therefore be useful.

Temperature plays a leading part. The passage of a current of electricity through water engenders heat, the addition of salt increases the conductivity of the water, more current passes, the raising of the brine temperature still further increases its conductivity, consequently the tendency to heat is further increased; these are problems to be contended with in the working of electrolysers, which are liable to be aggravated by a changeable climate.

The best temperature for electrolysis has been found to be 25° to 28° C. If this be exceeded, a falling-off in chlorine production is noted; and if the temperature be allowed to exceed 35° C., there is an actual loss in the chlorine made, which is either driven off or converted into chlorate, useless for bleaching or sterilising.

Again, if the temperature of the electrolyte be too low, as in frosty weather—say, 0° C., or even 5° C.—electrolysis hardly takes place, electrolytic decomposition is retarded. When the temperature of the brine is raised—say by a steam coil—rapid electrolysis commences, as evinced by the smell of chlorine given off. Users of electrolysers should, in cold weather, bring up the temperature of the brine to, say, 25° C. before commencing electrolysis; it saves current and time.

In hot weather the control of temperature requires some attention; but before discussing this subject, it should be stated that there are two distinct types of electrolysers in use—the "constant flow" and the "circulating" types. In the former, the liquor runs once through and is ready for use; but it is weak in chlorine, and mainly suited to laundry and sanitary work. This form of electrolyser is, however, fairly cheap to construct, and there are a number in use bleaching textiles and paper.

The only means of increasing the chlorine strength in the "constant flow" system is:—

1. To employ stronger brine (causing more amperes to flow).

2. To increase the area of the electrodes, or to combine both methods (this is already done in the largest patterns of this type).

3. Reduce the speed of brine flow, allowing more time for the current to do its work.

The hindrance to the development of this type of electrolyser is, that the limit of temperature has already been reached.

Refrigerating within the electrolyser was long ago attempted and abandoned on account of its complications and the formation of scale, mentioned later, with the attendant difficulty of its removal.

The "circulating" type was the outcome of the attempts made to solve the problems involved when it was attempted to increase the chlorine strength in the earlier types.

To counteract the rising temperature, refrigeration was resorted to. In the Schuckert type, a coil immersed in running water is placed below the electrolyser, and the brine in process of electrolysis is circulated by a pump through the coils. In the Oerttel type the process is reversed; the electrolyser is placed in a generating tank, in which there are two or more refrigerating coils, through which the water flows by natural fall.

The circulation of the brine through the electrolyser is automatic, being effected by the effervescence caused by the liberation of the hydrogen gas in the electrolyser, which raises the level of the liquor in the cell some ⅝ in., when it overflows naturally and briskly.

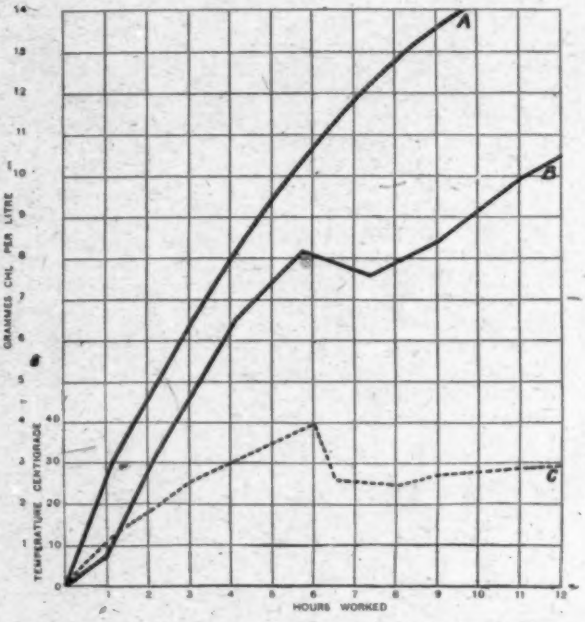
This system avoids the cost of driving the pump, together with its frequent repair, and the gradual loss of efficiency due to the furring-up of the coils with a deposit of scale, which cannot be got off, otherwise the output of both systems is about the same, for salt and current employed.

Control of temperature is effected in the "constant flow" type by accurately mixing the brine to a given standard, the only effective test being the hydrometer. Mixing by weight is fallacious, as salt in damp weather rapidly gains weight (and here again a note of warning is called for; the best salt for the purpose is the rough crystal variety, as used for fish curing; if rock salt is employed, containing 15 per cent. or more of clay, the density of the brine will be somewhat affected).

The rate of flow through the electrolyser is regulated by a tank provided with float feed giving constant pressure, also by a check valve allowing of the passage of a measured quantity of brine per hour.

Should the temperature rise in summer beyond these controls, there are two methods of checking it, either by reducing the density of the brine (causing less to flow) or by increasing the rate of flow of the brine, the former being the most rational and cheaper method.

In the "circulating" type, the temperature is ordinarily controlled by the cooling coils. This suffices in England;



Variation of Chlorine Production with Temperature.

in hotter countries, the number or area of the coils may be increased, the strength of the brine may be reduced, or the water itself may be artificially refrigerated (by no means so expensive a process as has sometimes been asserted).

In connection with the water supply, means should be employed to keep the pressure constant; a diminished pressure means reduced flow and a rise in temperature. The use of a reliable and sensitive thermostat is strongly recommended, capable of checking a rise of 2° F. in temperature. The adoption of these thermostats in electrolysers has been one of the most notable improvements effected since electrolysers were introduced, comparable only to the use of a good governor on an electric light engine, as varying temperatures were accountable for most of the troubles in connection with the running of electrolysers; but, as with automatic cut-outs, it pays to secure the best type procurable.

The accompanying chart illustrates the effects of irregular temperature on chlorine production; A is the ideal chlorine curve, corresponding to steady electrical current and perfect water control; B is the actual curve, showing the faults due to irregular temperature; C is the temperature line.

At first, chlorine production is very slow, due to low temperature. As soon, however, as 20° C. is reached the curve rises rapidly, but it is then arrested by excessive temperature, when some of the chlorine made is doubtless lost;

at this point water was turned on, and as soon as the brine had cooled down again normal chlorine production was resumed, but the total production in 12 hours only reached 10·5 grammes per litre, in place of 12 per 10 hours, which it should have been, or 14 grammes under ideal circumstances (14 grammes per litre corresponds to the performance of a steam boiler using best coal, carefully stoked, with flues recently cleaned; the writer recently, working under very favourable conditions, produced 13 grammes in eight hours.

Another point not generally known adversely affecting chlorine production is bright sunshine in hot weather. The electrolyser whilst at work in the summer should have the bright light screened from it (in hot climates totally excluded), and the liquor as soon as made run into the storage tank, which is closed to light and the atmosphere. As warm liquor keeps badly, it might be advisable after completion of electrolysis to continue the circulation of cold water until the liquor is chilled to 20° C., or, even better, to 15° C.

Another method of improving the stability of the made bleach is to render the liquor distinctly alkaline by the addition of caustic soda in the storage tank; but this requires an appreciable quantity of caustic, and is otherwise not advisable, as it makes bleaching very slow, and introduces the old irregular bleaching action that electrolytic chlorine is intended to obviate. If loss is to be avoided the bleach should be employed as soon after making as possible, the ideal method being to prepare it overnight, and use fresh in its highest state of perfection next morning; this is practicable where an efficient thermostat and a sensitive cut-out, both of the best makes, are in use, as if current and temperature are constant electrolysis will be perfect.

Cleansing.—No water is pure—it holds carbonates and sulphates of lime and magnesium in solution. Salt, particularly rock salt, contains both these minerals, which are deposited on the *positive* side of the electrodes in the form of scale, which, if not promptly removed, causes serious trouble and loss of efficiency, which is easily increased if the brine is turbid through being mixed or stirred just before use; if the brine holds clay in suspension, cleansing may be very difficult, as it sticks like paint. The removal of scale is, fortunately, very simple; reversal of the current loosens the scale, as hydrogen gas is generated between the face of the electrode and the scale, loosening it; it is then easily washed off by a powerful sluicing with a hosepipe. Usually this washing is done in a perfunctory manner, and sufficient care is not taken to see that the circulating passages are kept open. Sometimes the scale is very hard, and falls off in flakes, which require breaking up with a steel rod; at other times it comes away in grains resembling old mortar. If the passages are blocked, experienced observation of the diminished flow will show where to locate the trouble. Scale, and particularly a coating of clay, impedes the passage of the current by insulation, and naturally greatly diminishes the chlorine output.

New electrolysers do not show their maximum output for the first day or two; it takes time for the electrodes to become saturated with brine and for certain impurities to be eliminated. On the third day of running, it is very advisable to take hourly records from starting up, for future reference, of volts, amperes, temperature, and chlorine yield. Thereafter, one or more observations a day, compared with the standard chart, will indicate any falling-off, when the cause should be sought; a drop of a few volts will affect the amperes considerably. This will affect the chlorine yield and also the temperature; if the brine is too weak, the amperes will be down.

A brisk circulation during the first few hours shows everything is right; a sluggish circulation denotes something wrong—electrodes dirty, passages choked, &c. The electrolyser, practically, *cannot* go wrong beyond righting, unless the electrodes are worn out, and they should last 18 months' day work, always provided that they have not been overheated, which makes them spongy, when they waste.

The electrolyser should be washed and wiped down daily to remove the salt crusts carried by the spray all round, which would in time cause leakage of current, and this applies to the exterior foundations, which are all the better for a few coats of bitumastic varnish, to prevent absorption of brine, an excellent medium for carrying current to earth.

Electrolysers are employed to-day for bleaching every class of textile fibre, and the bleached article, whether sewing thread or cloth, shows from 8 to 10 per cent. better breaking strain, due to the bleaching liquor distributing itself more regularly among the material; being quicker in its action, it should be used weaker. Its level work is quickly appreciated by dyers. Excellent results are also obtained in laundries. Hospitals and asylums are well satisfied with the electrolyser as a steriliser. Manufacturers troubled with foul reservoirs or mildew among goods in course of manufacture, and with evil-smelling water, have found relief by the adoption of the smallest electrolyser made.

Quite recently a firm of flannel manufacturers, whose reservoirs were so choked with weed that it was impossible to draw a rake through, cleared them completely in 10 days at a cost of 1s. 6d. per day, and this without any nuisance or interruption to their working; nor were the fish killed. As a proof of their satisfaction, they have expressed their willingness to answer any inquiries addressed to them. The same size of electrolyser employed for sterilising drinking water would be capable of dealing with 200,000 gallons a day, which is represented by a volume of water measuring 80 ft. × 50 ft. × 8 ft. deep.

A GOOD SUMMER LOAD.

By "RESEARCH."

Supply authorities all want a consumer who will take a good deal of power in summer and very little in winter. It is doubtful if many of them realise the benefits to be derived from pushing the use of refrigerating plant. Most of this plant is at present steam-driven, and it is up to the electrical industry to see that the steam engines are replaced by electric motors. Also this type of plant is not nearly so extensively used as it might be, and the advantages of such plant could be laid before the right people by motor manufacturers and supply authorities. Who are the right people?

Butchers,	Dairies,	Butter factories,
Fishmongers,	Hospitals,	Dry cold air for blast furnaces,
Abattoirs,	Large private houses,	
Hotels,	Provision m'rchants,	Fur stores,
Restaurants,	Markets,	Docks.
	Ice stores,	

What revenue are the supply authorities likely to get? Let us take the case of a butcher's shop of medium size. A 5-H.P. motor is installed, and the yearly revenue is £25. Of this sum £16 is received for the two summer quarters. The price charged per unit is 2d. The capacity of the plant is 2,000 cb. ft. of insulated space kept at a temperature of 30° F. The motor is run about six hours per day, and meat and game are kept in the ice room until required. The approximate yearly cost, apart from electricity, is about £12 for oil, ammonia, and upkeep of plant.

The working of the plant is as follows;—The motor drives a compressor which compresses ammonia gas. The ammonia is passed through an oil separator to a condenser. In this condenser the ammonia gas is condensed into a liquid, which flows into a storage tank. From this tank it passes through an expansion valve into coils of pipes situated where the low temperature is required. In these pipes the ammonia again becomes a gas, and passes back to the compressor to pass through the above cycle of operations.

It will be seen that the process is very simple, and the plant requires very little skilled attention. The capital cost is the only objection a consumer might have, and the running costs are practically only for the electricity consumed. As a nation, we have to be very careful just now that all food is utilised, and if there were refrigerators at all our docks and markets, we would not hear so much of food being sold to soapmakers or thrown away as useless.

ELECTRIC COOKING IN THE FACTORY.

During the last few years a great amount of thought and attention has been given to the beneficial effects arising from improved hygienic conditions in the factory. The subject is a difficult one, because the would-be reformer and the workman often hold radically different opinions as to what constitute improvements, especially if traditional methods are at all disturbed.

Electric Kitchen, Messrs. Haworth's Mills.

One direction, however, in which considerable improvement has taken place is in the provision of well-cooked food at low cost for those employés who prefer to obtain their meals in this way, and many elaborate works' kitchens and dining-rooms have come into being as a result of the realisation that improved health means a higher standard of efficiency.

An example of welfare work of this class is found in the four modern electric kitchens which have been installed by Messrs. Richard Haworth & Co., Ltd., at their mills in Ordsall Lane, Salford.

Messrs. Haworth are one of the largest, and oldest, cotton manufacturing firms in the Kingdom, and their several adjacent factories employ a large number of operatives, many of whom reside in the vicinity and obtain their meals at home or bring food with them. The supply of food, cooked in the mill, has therefore been somewhat of an experiment, though we gather that its advantages are becoming gradually recognised by the operatives, of whom about 500 are now being catered for.

Through the courtesy of Messrs. Haworth, and of Carron Company, who supplied all the equipment, we were recently able to inspect the cooking arrangements above referred to.

The kitchens are very similarly equipped, each having a large three-oven range with ample boiling and grilling accommodation, a heavy boiling table, and hot closets for keeping food warm. The apparatus is "Carron standard," with white enamelled back plates, stove enamelled black parts, and plated and polished mouldings, &c., presenting a smart appearance, in keeping with the bright and well-ventilated kitchens in which it is installed.

Each range comprises three ovens, each measuring 22 in. × 20 in. × 22 in. inside, built up on the unit principle, with top and bottom heating elements, each arranged for three-heat control and loaded to a maximum of 5.5 kw.

The heaters, divided into four groups, top and bottom, are carried in shallow trays, which can be slid out for examination at a moment's notice, having pin and socket connections at the back. The heaters are built up of standard Carron porcelain bars carrying exposed heating spirals.

The ovens have porcelain enamelled interiors, doors fitted with toughened glass inspection windows and thermometers, and the interior fittings being all detachable, the ovens can be washed out when necessary.

The hot-plate over the ovens has two boiling sections—each having three intensely heated portions, arranged for suitable heat regulation—also a third simmering section, with a griller and toaster underneath, wired for 5 kw., with two separately controlled elements.

Hinged doors under the boiling sections enclose hot closets heated by the latter, and the controlling switchboards, on which are mounted three-heat rotary indicating switches, fuses, and pilot lights, are supported over the hot plate by brackets attached to the splash plate behind. Each range is loaded to approximately 32 kw.

The hot closet accommodation varies, two of the kitchens each having two 11-ft. closets, in another case an 11-ft. and a 6-ft. closet are installed, while one 11-ft. closet only is fitted in one instance.

These closets also serve the purpose of counters over which food is handed to the operatives; the closets are constructed of fine cast-iron panelling with mild-steel sliding doors, are lined with white porcelain enamelled sheets, and fitted with white enamelled perforated shelves. The heaters consist of groups of Carron porcelain bars carrying wire spirals, and are all interchangeable, fitted in the back of the compartment, and can be pulled out instantly, as they have pin and socket connections.

Standard Carron Range and Boiling Table.

D

The total loading of these hot closets is 21 kw., each section being separately controlled and the connecting leads carried to terminal boxes at opposite ends, where three-heat rotary indicating switches and fuses are mounted.

Electric Kitchen and Dining Room, Messrs. Haworth's Mills.

Three of the kitchens have 6-ft. boiling tables, while the fourth is equipped with a table half this size; both sizes are built up on the unit principle, having certain intensely heated, separately controlled areas in the boiling top; each table is mounted on heavy cast-iron feet, has a pot rack underneath, and a white porcelain enamelled splash plate and switchboard over this carrying three-heat rotary indicating switches, fuses, and pilot lights.

The large tables are each loaded to 6 kw. maximum, and the small table has half this loading. A distinctive feature of the boiling tops or hobs on Carron ranges and boiling tables—to which attention was drawn in our issue of April 6th last—is the system of intensely heated surfaces employed in place of the hot plate commonly found in such circumstances. The surfaces are heated by groups of mica insulated elements each with 300 kw. loading, which are clamped between asbestos pads and a planed surface under the top plate. These elements are connected where possible to small ribbon busbars at the ends, and are each clamped independently, so that the removal or replacement of one of them is a small matter, merely involving the raising of the top plate and loosening a few nuts; usually the interior connections of heating elements are of beaded nickel wire.

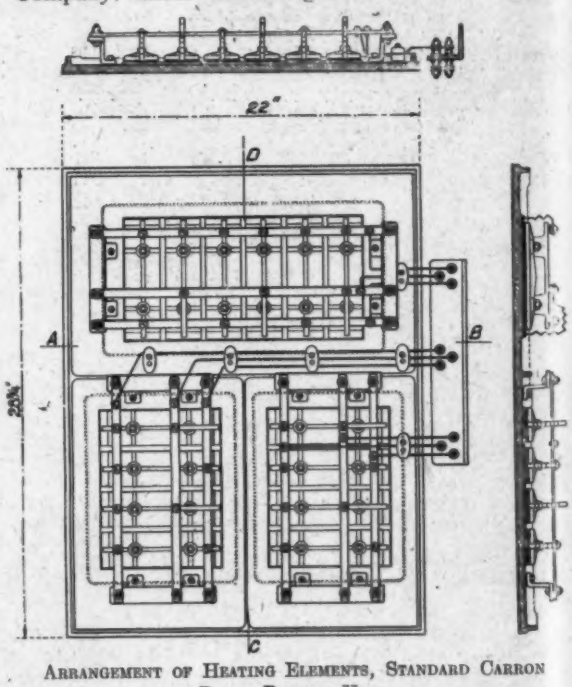
It will be gathered that this arrangement safeguards the working of the installation, though we understand that experience has shown, as one would expect, that it is inherently more reliable than the usual hot-plate system, and practically no trouble has been experienced with it.

At Messrs. Haworth's establishment, the workers are required to purchase checks the day before (which enables the food requirements to be estimated), which are exchanged over the counter for food, men being charged 6d., and women 4d., for a cut off the joint and two vegetables; in addition puddings, pastries, and sweets are provided at extra charges. Breakfasts are supplied, and food brought from home is also warmed up; a considerable amount of pastry is also supplied for consumption at home, and the charges are based on the bare cost, it being considered that the firm benefits indirectly from the improved health of the worker. No tea is provided in these kitchens, as the predilection of the cotton operative for that beverage at all hours of the day has long necessitated the provision of a regular supply of boiling water for that purpose in various parts of the mill.

The apparatus is run at 220 volts, being roughly balanced on the 440-volt circuits of the Salford Corporation, and, as the supply is obtained on bulk terms, the cost per unit amounts to between .5d. and .6d.

The kitchens are in charge of an experienced cook, with a staff which, apparently, appreciates the facility of electrical methods; the equipment has been in use for varying periods, and is not working at its full capacity, one kitchen having only recently been completed. Under present conditions, however, we understand that the cost of energy works out at less than one halfpenny per person per meal, including the cost of energy for kitchen ventilation.

In conclusion, we are indebted to Messrs. Haworth and to their chief electrical engineer, Mr. Forbes, for supplying many interesting details regarding the operation of this equipment; we also have to acknowledge the assiduous attention of Mr. C. McKinlay, of Carron Company, under whose ægis the visit was undertaken, and our indebtedness to Mr. A. R. Wood, manager of the Carron electric cooking and heating department, for arranging the visit.



Arrangement of Heating Elements, Standard Carron Range Boiling Unit.

Electricity used for Driving Cattle.—It is reported that an electrically charged rod for driving cattle is being introduced upon some of the ranches of Western Texas. It is said to be specially suited for making rebellious cattle enter dipping vats, branding pens and other enclosures into which it is ordinarily a difficult matter to drive them. The rod is constructed with four dry cells and a coil and is equipped with a button by which the current may be turned on when it is desired to apply it to an animal. —*Electrical Review and Western Electrician.*

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

B.T.H. Ironclad Switchgear.

The British Thomson-Houston Co., Ltd., of Rugby, has brought out improved patterns of ironclad oil-break switchgear for mining and industrial service. It is designed on the draw-out principle, with interlocking devices to prevent accidental contact with live metal; all parts are readily accessible when made dead by withdrawing the carriage. The switches are of the free-handle type, and have an accelerated gravity break, and double-break on each pole. They are made in two sizes, rated at 120 and 500 amperes up to 650 volts, and 50 and 120 amperes up to 3,300 volts. The larger size is illustrated in figs. 1 and 2 herewith. The switches

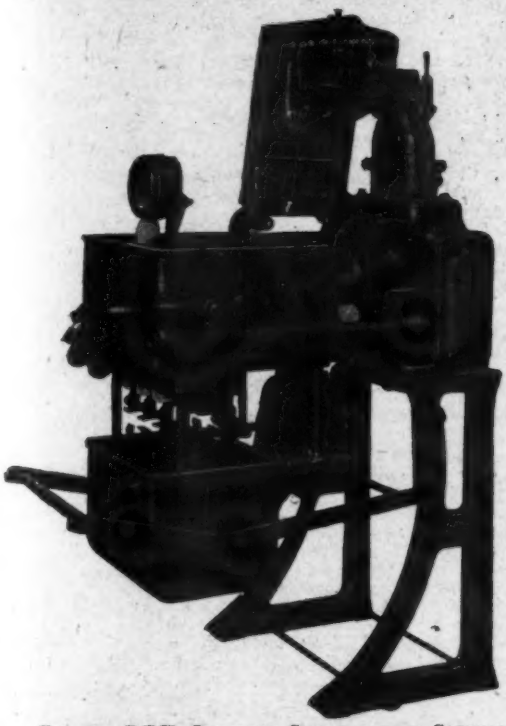


Fig. 1.—B.T.H. Ironclad Switch, with Carriage Withdrawn, Cover Open, and Tank Lowered.

can be mounted side by side and coupled up to common bus-bars carried in connection chambers; automatic features and a time-element device can be supplied if desired.

For starting induction motors an automatic device is provided which temporarily raises the current setting, thus enabling the momentary starting current to flow without tripping the switch. Leakage protective relays, and electrical interlocks with controllers, may be employed, and provision is made for mounting ammeters and voltmeters on the switch body. We note that the dimension diagrams are figured in both inches and millimetres; metric weights and measures are also given in the shipping specification, in addition to the English units.

A Convenient Electroscope Exciter.

The illustration, fig. 3, shows a very simple device for exciting electroscopes, and for similar purposes when a small charge of known sign is required, which has been found to be of con-

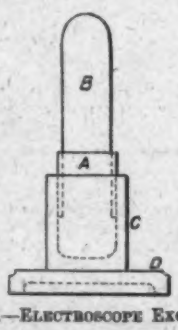


Fig. 3.—Electroscope Exciter.

siderable use in experimental work. The appliance consists of a smooth metal tube, A, one end of which should be closed and rounded, fixed to a varnished glass handle, B, by means of shellac. The sharp edge of the tube should be well covered with the insulating adhesive. This fits rather loosely into a somewhat larger tube, C, also of metal, but lined thickly with fur. This may be screwed to a wooden base, D, preferably hollowed at the back and weighted with lead. The tube, A, becomes negatively charged by merely raising from the table, only one hand being required, since the base is sufficiently heavy to retain its position. An electroscope may be charged negatively by contact with the small tube, or positively by induction. In the instrument constructed by the inventor the inner tube is the nickelled case supplied with a small stick of shaving soap, the fur being a piece of moleskin. The inventor is Mr. H. J. Gray, of Lewes.

The "Diffusa" Reflector Fitting.

This unit is designed by the Sun Electrical Co., Ltd., of 118, Charing Cross Road, W.C. 2, for use with half-watt lamps, and consists of a standard "Sunlite" P.E. extensive reflector fitting, having an opalescent reflector bowl suspended from it by three chains and ingenious spring clips. These clips, while securely

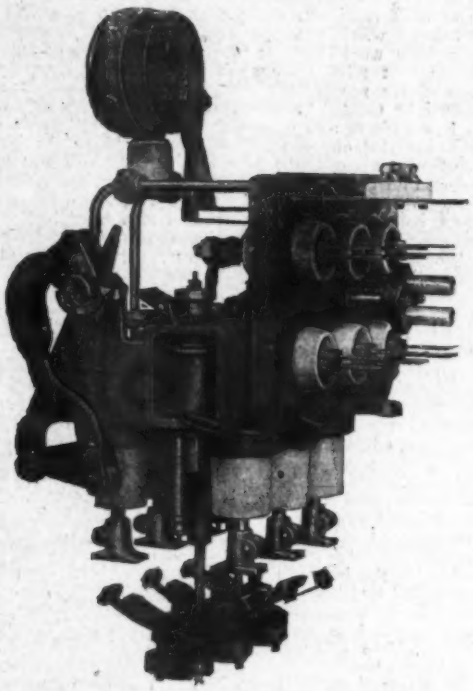


Fig. 2.—Mechanism of Switch.

holding the bottom reflector in position, do away with the necessity of boring the glass bowl. The bowl is so placed in relation to the top reflector that the resulting illumination is a combination of diffused and indirect light. The lighting effect is similar to that obtained with the makers' standard semi-indirect unit, but is concentrated over a slightly smaller area. The three-point suspension does away with the shadows usually thrown by ring fittings.

Fig. 4.—"Diffusa" Reflector Fitting.

Ample ventilation is provided, there being, in addition to the opening between the top reflector and bowl, adequate ventilation holes in the neck of the fitting. This system of lighting is especially suitable for use where fine, intricate work involving great accuracy is carried out, as it does not tire the eyes.

A NEW INDUSTRIAL LEAGUE.

The objects of the Industrial League for the Improvement of Relations between Employers and Employed were explained in a series of speeches delivered at a well-attended dinner at the Café Monico on Friday last.

Mr. Lee Murray presided, and amongst those present were Sir Albert Stanley, M.P. (President of the Board of Trade), the Rt. Hon. F. Huth Jackson, Mr. G. H. Roberts, M.P. (Parliamentary Secretary to the Board of Trade), Mr. G. Wardle, M.P. (Chairman of the Labour Party), Sir A. Denny, Sir J. McCall, Sir C. Allom, and others.

The Chairman said that their meetings had been going on for about two years. They started with a number of men who held diverse opinions on almost every subject, and who came together to see if they could not find some means by which they could compromise, or, at all events, to find the explanation as to why they differed. The result had been that they had found that the men who differed from them were men who sincerely and honestly held their views because of their particular experience. Latterly they had concentrated on what was the second important menace that Great Britain would have to face after the war, namely, the enormous debt piled up against us in foreign countries on account of the war. That debt had to be reduced, and it could only be tackled by increased productivity, which would mean less imports and more exports. Our imports so enormously exceeded our exports that we could reduce imports tremendously without affecting our exports position at all. In order to do this it was necessary (1) to get the orders, (2) to manufacture the goods. During the last two years there had been set up in England a number of co-operative organisations consisting of different employers whose business it was to get out after trade after the war. Those organisations, strong as they were in finance, in personnel, and in technical and commercial ability, had the necessary qualifications for their work, securing new markets and increasing our trade in existing ones. They could leave to those organisations and to the individual manufacturers the task of securing increased orders. But how were we equipped for turning out the goods when the orders were obtained? He always combatted the statement that our manufacturers had failed as producers; they had not done so. If they said that our manufacturers had failed to stem the aggressive competition of the Americans and the Germans then they would certainly be right. The aims of our manufacturers had been too local and personal instead of national. Since the war we had had an enormous increase in productivity in this country, and the capacity for production was greater than was ever imagined before the war, which would enable us to cope with the whole of the increased orders that we should get. The American did not hesitate to scrap anything the moment he knew there was something better to be obtained. Our manufacturers would have to do the same, and to be supported by the trade unions and the Labour people in introducing improvements when they were possible. All the endeavours of the organisations he had mentioned to get fresh orders would be rendered vain and useless unless they had a proper relationship between employers and employed, and unless they appreciated their community of interest. If the relations were to be as they were before the war, then it would not be worth while to get out for new business, but if the relations were as they should be, they would want all the orders they could get, for they would then be able to get the stuff out and fill the orders. There must be a minimum wage for every willing worker. That being conceded by the employer, he had to have the unquestioned right of sacking any man who could not or would not earn that minimum wage. There was to be payment by results. By that, every class of work that could be measured would be paid for according to the industry and the energy shown by the men engaged on it. He did not doubt that different systems would be in use in different parts of the country, but a man had to be paid what he earned. Manufacturers must keep their plant and equipment up-to-date. How they were to get the money could be left to those who were going into the industrial banking system. The workers must do everything possible to secure a maximum output. There had to be no more restrictions of output, no more "ca canny." If the men realised that their interests and those of their employers were identical they would show that their hearts were in this thing by turning out every possible ounce of stuff. The social status of all the workers must be uplifted. The employers had to be educated up to a realisation of their responsibilities. Their employés also had to be educated, and their children thoroughly educated in ideas of patriotism. Where would the Germans have been to-day but for that? The workman must not be allowed to think that he was a machine tool; that sort of thing had to stop. Another thing necessary was the encouragement of the small manufacturer. He disagreed with the view that headway could only be made through huge industrial organisations. Big organisations were necessary for the technical advancement of experimental work, because they had the finance and the facilities, but the history of England had been the history of the small manufacturer, and the small manufacturer, specialising in a few lines, had held his own against departments of the big octopus concerns. The small manufacturer had also a great part to play in the solution of the problem of the relations between employer and employed. It was to him that they had to look in a very large measure for the propaganda work that had to be done. How could they help to put those ideas into effect, and how could they do their best to get increased productivity by improving the relations between employers and employed? Those were the questions they had to ask themselves.

Mr. H. Scholey said that they were a society of missionaries. For the past 20 months they had been holding comparatively small meetings, and hardly one of them had not modified his views in connection with the great industrial question. An absolute frankness had prevailed at their meetings, and in consequence they had been able to understand one another's difficulties, and had been able to sweep away a good many misconceptions. The Association started with a gathering of six or eight men, and was gradually extended until it came to the decision that it might be made of advantage to the rest of the industrial world, and now they were seeking to extend it still further. They had done a great deal of good work, and would like to go down to the large centres of industry and organise allied associations. Their work should be of an educational character—education in its widest possible sense was meant, including anything that was embraced in the subject of scientific management. They aimed at a propaganda which would bring before the employer and the workpeople the absolute necessity of composing their differences so that when the proper time came they would be able to present a united front to the great industrial struggle that was going to take place. They wanted an immediate increase in their membership, and were going to invite the co-operation of employers throughout the country, no matter what industry they represented. They would also ask the assistance of the trade unions. The Association should develop by forming branch organisations, which could arrange small meetings of employers and employed, and they in the central association might give them a great deal of help. Their special speakers could pay special visits to places where help was particularly needed. They must, if possible, get to the individual worker. There were a good many questions that they thought the worker should understand, or he could not appreciate the employers' difficulties. The worker could not be expected to take a proper interest in the great problems of trade and finance unless he was brought in touch with them, though not in detail. Education was needed for the manufacturer also, because he was afraid that many of them were going to give some difficulty, but with a well-informed public opinion and with a number of employers taking a real interest in those things, the ultimate result would be that the difficult employers would take a much wider view of their responsibilities to their people, to their industry, and to the nation at large. As to the lines on which the Association should be run, they were aiming at the small manufacturers. Very large numbers of them would be interested in this scheme. It had been questioned whether the Association was not in danger of overlapping the work of other organisations. They had ascertained what those organisations were doing, and as a result they thought that they were on a special line of their own, though they were working in close harmony with other associations, and at any time that it might be necessary, they would be ready to come together in the common cause.

Sir Albert Stanley said that he had never had any objections to associating with so-called Labour leaders. At the Board of Trade they were prepared to take the responsibility for dealing with the most serious outstanding problem that confronted them—the relation of the employer to the employed. He had had a good deal of experience in America. He was identified with two separate undertakings, one rapidly succeeding the other. Each of those undertakings had in its employ practically 30,000 men. One of the undertakings was really the last word in trade unionism. Every single employé was bound to accept membership of the union. The other undertaking was entirely free from that sort of influence; so far as he knew not a single man identified with it had any connection with any trade union movement. He found that in the trade union undertaking provision was made whereby any grievance could be brought forward and carried right to the very top for the purpose of adjustment. It frequently came to his notice, as manager of that undertaking, that grievances on the part of the men had a real genuine foundation. It frequently came to his notice that some sub-official was not justified by the facts in some action he had taken. As a result of the method which existed, many grievances were remedied. No such machinery, at least, no adequate and satisfactory machinery, existed in connection with the other undertaking. If there was any grievance it lay smouldering beneath the surface, and had no opportunity for adjustment. The result convinced him that whether it was done by established trade unions or by securing the co-operation of the men's selected leaders, whatever the system might be, it was absolutely essential for the successful conduct of a business in which a large number of men were employed that there should be set up machinery which would secure to the men an opportunity for bringing their grievances forward and securing them against punishment on the part of the officials. Undoubtedly, in this

country to-day there was a great deal of dissatisfaction, and a growing dissatisfaction among the working people. They had to face that and recognise it, and it was the duty of every man who employed labour, everyone connected with the Government, and every trade union leader, to recognise it, to face it honestly, and to take the right steps for bringing about an immediate improvement. The lesson that he learnt in America was a lesson which could be adopted here to-day. Taking it on the whole, he could not help feeling that the working men of this country had not been sufficiently educated, and had not a sufficient knowledge of the problems that confronted the business interests of this country. He felt that somehow, whether it was done through their accredited leaders, or however it might be done, they had to find a way whereby those great problems, which were going to be infinitely more serious when the war was ended, could be brought home to the working people so that they might have a better understanding of them, and so that their decisions on them might be based on an intelligent knowledge of what needed to be done. Thereby they would have the opportunity, the privilege, the right of associating with the employers so that whatever might be their action, it would be based on facts, and not on mere gossip, or, as sometimes was the case, on an unfortunate expression in the daily Press. The chairman had paid proper tribute to the success which had crowned the efforts of the men who, in times past, by hard work and diligent effort, had established business undertakings in this country. What they had to consider now was whether they could travel on that same road and continue to apply those same methods in the future. If they investigated the progress which had been made by Germany during the last 15 or 20 years, and if they compared the value of her export trade, and saw the curve of her alarming growth and expansion, they would observe how close that line came to the value of the exports of this country in 1914. When they saw that, he could not help but think that they would then give careful investigation into the methods which brought that country so alarmingly close to us. The chairman had suggested that the ideal to aspire to was that our exports should show an enormous expansion, and our imports a corresponding diminution. During the seven months that he had held Cabinet office there had been times when he had felt that if he could be relieved of some of the burdens of that office he would be quite content, but if he could be assured that by holding on he would be helping to bring about the accomplishment of that particular object, then he would be very happy indeed to be President of the Board of Trade. He was satisfied that in this country we had the ability and the resources that were necessary, and he knew, too, that every one of our Overseas Dominions and all our possessions were most anxious to co-operate with us in solidifying this great Empire and in making it one unit with one common aim and aspiration—the creation of the greatest trading and industrial Empire the world had ever seen. But unless they found some solution to that problem, some way whereby the employé would be more contented, and have a better recognition of the great issues that confronted them, he could not see any hope of that ambition being fulfilled. He felt that if the employers of this country would only recognise the altered circumstances, realise that the conditions had changed, that we were living in an entirely new world, and that the working man was going to demand more and more his share of the comforts of life, then he believed that that would at least go a long way toward solving that terrific problem. Sir Albert referred to the necessity of co-operation of the employés, without which there was no possible chance of a permanent success.

(To be concluded.)

LEGAL.

W. Sandorides, Ltd., *v.* Franco-British Electrical Co., Ltd.

In the King's Bench Division, on July 19th, Mr. Justice Ridley heard an action in which plaintiffs sued defendants for rent in respect of an electric sign at 7, Oxford Street.

Mr. J. G. Pearce, for the plaintiffs, said the claim was for four quarterly payments, from August, 1915, to May, 1916, due to the plaintiffs from the defendants under an agreement by which the plaintiffs granted to the defendants a licence to place an illuminated sign over a part of 7, Oxford Street, W., for a period of five years from August, 1914, and for which the defendants agreed to pay £120 a year in quarterly instalments. The sign which was placed there on the execution of this agreement, and which was there still, was an advertisement of Pears' soap. It was a very striking feature as one came along Oxford Street or down Tottenham Court Road. The defence set up was that under the Defence of the Realm Act there were certain regulations regarding the lighting of the London streets, and restrictions were imposed by which the defendants were no longer able to carry out their agreement. Apparently, said counsel, this meant that the contract was dissolved. But the answer to this was obvious. The sign was a sign by day as well as by night. By day it was visible from 300 yards; it was there still. The only effect the working of the Defence of the Realm Act could have would be to make the sign of less value—certainly not of no value. There was nothing in the Defence of the Realm Act to prevent the sign being illuminated during certain hours even now, and a great many signs were at the present time being illuminated up to nine o'cock.

Mr. Dighton Pollock, for the defendants, argued that if the sign was not lighted, it was of no use to his clients. If his Lordship held that the sign still had a day value, then the defendants had a totally different thing to that for which they contracted.

His Lordship said the plaintiffs were entitled to succeed in this case. The defendants might think they had a hard case, but there was a certain amount of hardship either way. In this case it did not appear to him that this was a contract which was rendered impossible. Mr. Pollock had argued that the contract was only for an illuminated sign, but it seemed to him (his Lordship) certain that the sign was being used in the day time. He was not inclined to accept the position of the defendants, who took the electrical view, that it was impossible to do without electricity. The restrictions on the electric lighting of the London streets had been lightened, and the defendants still had the advantage of the illuminations during certain hours, and in the future there might be still further facilities.

His Lordship entered judgment for plaintiffs for £120 and costs, and on the application of Mr. Pollock granted a stay of execution pending a possible appeal, the money to be paid into Court within 14 days, and costs to be taxed and paid to plaintiffs.

E.S. Co., Ltd., *v.* Tredegars, Ltd.

In the King's Bench Division, on July 18th, Mr. Justice Ridley had before him the action E.S. Co., Ltd., proprietors of Electrical Supplies Co. *v.* Tredegars, Ltd.

The plaintiffs claimed the sum of £263, the price of goods sold and delivered, and defendants admitted that they were indebted to the plaintiffs for that sum, but counterclaimed for £193, goods supplied to plaintiffs, and paid the balance into Court.

Mr. A. H. Richardson, for the plaintiffs; Mr. C. H. Smith, for defendants.

Mr. Smith, opening the case on the counterclaim, said the action was originally brought by the Electrical Supplies Co. for £263 for goods supplied. The defendants, who also dealt in electrical goods, claimed that they had a set-off against the amount claimed for £193, goods supplied to plaintiffs, and the defence to the counterclaim was that, although the plaintiffs actually ordered these goods, it was on the condition that they were to be equal to sample and subject to the approval of a customer. The plaintiffs said the goods were not according to sample, and, therefore, there was no contract.

The plaintiffs, said Counsel, approached the defendants with regard to the purchase of electrical switches, and defendants said they had 45 gross of Japanese switches, of which they would supply 30 gross at 10s. 9d. per dozen. Mr. Summer, their manager, said he would like a sample, and then he would let them know definitely whether he would take the 30 gross. The next day he sent for the sample, and the defendants eventually sold the plaintiffs the switches as Japanese switches. What had evidently happened, suggested Counsel, was that the plaintiffs had a contract to sell to Edison & Swan some English switches, and that they were trying to pass off on them Japanese switches. Edison and Swan refused to accept them, and then the plaintiffs tried to repudiate the contract.

After hearding evidence,

His Lordship, giving judgment, said he was of opinion that the contract was provisional, and subject to an order from Messrs. Edison & Swan, who, when the goods arrived, refused to accept them, as they did not comply with their order, because their order was for English, and not Japanese, switches. He had come to the conclusion that there was a conditional term upon which these goods were ordered. The plaintiffs succeeded on the claim, and the defendants failed in their counterclaim, and there would be judgment for plaintiffs for the amount paid into Court, and for £193, the balance, together with costs on the claim and counterclaim.

C. J. Ferguson & Sons *v.* C. Isler & Co., Ltd.

In the King's Bench Division on July 19th, before Mr. Justice Atkin, an action was heard in which plaintiffs, electricians, of Chiswell Street, E.C., sued C. Isler & Co., Ltd., Artesian Works, Bear Lane, Southwark, in respect of the alleged detention by the defendants of a 50-H.P. motor and starter, which, it was said, was hired to them for a definite period of one week for work in connection with the Hackney Borough Council electrical supply service. The plaintiffs said they let the defendants have the hire of the motor under an agreement of April, 1915, together with apparatus for electrical wiring, and they also did the work of wiring cables suitable to enable the motor to do the work that was required. They claimed damages because, as they said, the defendants had wrongfully detained the plant, and in consequence they (plaintiffs) had had a claim against them by the firm of A. Bridgman & Co., Ltd., of City Road, from whom they had hired in order to re-hire to the defendants. The defendants denied that there was an agreement to hire for the exact period alleged, and they denied liability for more than had been paid into Court.

In giving judgment after hearing the evidence, Mr. Justice Atkin said he was of opinion that it was agreed that the period of the hire should be one week. It appeared that another starter had to be provided, and when the motor began to work it was found that the results were not as speedy as anticipated. The motor was kept for several weeks on the work. In the meantime, Messrs. Bridgman were wanting the plant and pressing the plaintiffs for

its return. The defendants wrote to say that they were ready to pay an additional hire figure, and they had had to keep the motor longer than was thought through difficulties that were not anticipated. He (the Judge) was satisfied that the period of hire agreed on was one week on the terms of £25, £20 for the fixing, and £5 for the hiring. The defendants kept the machine for some weeks, and then took up the position that the motor was hired without any stipulations whatever. He thought the plaintiffs did agree to the defendants retaining the motor for a certain period, but they gave notice of the termination, and henceforward there was wrongful detention by the defendants, and a violation of the plaintiffs' rights. He thought the defendants must have known that the consequence of their detaining the motor was that Messrs. Bridgman would take steps against the plaintiffs; and, in fact, Messrs. Bridgman did claim special damages against the plaintiffs because of the detention of the machine. The defendants did not release the motor until it was convenient for them to do so. He thought the plaintiffs were entitled to judgment on the claim for a total of £71 10s.; and he gave them judgment for this sum, and costs, including certain costs incurred in connection with the action against the plaintiffs by Messrs. Bridgman.

GAS LIGHT AND COKE CO. *v.* HACKNEY BOROUGH COUNCIL.

IN the Chancery Division, last week, Mr. Justice Astbury began the hearing of an action by the Attorney-General at the relation of the Gas Light and Coke Co. against the Mayor and Corporation of Hackney, which involved a complaint by the plaintiff company that the defendants were making differential charges in their supply of electricity, in breach of sections of the Electric Lighting Act, and plaintiffs asked for a declaration to that effect and an injunction.

Mr. Russell, K.C., Mr. Colefax, K.C., and Mr. Percy Wheeler appeared for the plaintiffs; and Mr. A. J. Walter, K.C., and Mr. Spence for the defendants.

MR. RUSSELL said the plaintiffs supplied gas for lighting and power and other purposes within a certain area, and the Borough Council of Hackney supplied electrical energy for lighting and power within a certain area which was within the plaintiffs' district, and they did that under the provisions of the Hackney Electric Lighting Order of 1893, the principal Act being the Electric Lighting Act of 1882, Sections 19 and 20 of which plaintiffs said were being violated. These set forth that where a supply of electricity was provided in any part of an area for private purposes, except in so far as otherwise provided by licence or special Act authorising such supply, every company or person within that part of the area should, on application, be entitled to a supply on the same terms on which any other company or person in such part of the area was entitled under similar circumstances to a corresponding supply; and the undertakers should not, in making any agreement for the supply of electricity, show any undue preference to any local authority, company, or person, but might make such charges not exceeding the limits of the price imposed by the licence or special Act. The matter in respect of which the plaintiffs were suing was the scale of prices published by the defendants in July, 1914. The scale was for lighting, alternative I, for any quantity of electrical energy used each quarter, not exceeding the equivalent of one hour's supply per day, at the maximum demand, 6d. per unit; for any further quantity of electrical energy in each quarter, 1d. per unit; alternative II was a flat rate. For power (this was what plaintiffs complained of), alternative I, a fixed charge of £1 per quarter per kilowatt of maximum power demanded, and a charge for electrical energy used of ½d. per unit. Consumers paying under this scale are allowed to use 20 per cent. of the energy consumed for lighting. The effect of that, said counsel, was that consumers of energy for power were supplied with energy for light at a lower rate than the persons who were consumers of light only. Counsel argued that a light consumer was entitled to be supplied with his light on the same terms as another person, and to give favourable terms to a power consumer in respect of his lighting was to induce him to become a customer.

SIR JOHN SNELL, Vice-President of the Institution of Electrical Engineers, then gave evidence, and said he had investigated the question whether or not the defendants had been supplying electricity at a profit or loss, having regard to the charges that were made, and he had come to the conclusion that a profit was made on lighting but a loss on the supply of power.

In cross-examination, MR. WALTER asked Sir John whether he was aware that this year, with 1 million units less for lighting and 6 millions more for power, Hackney had wiped out a loss, and carried forward £6,000 for the relief of rates.

SIR JOHN said he did not know that, as he had not had access to the accounts for this year.

MR. WALTER: And the whole net increase to consumers is not 15 per cent.

WITNESS: You have done very well.

MR. WALTER said the cost of material, including coal, had much increased, and the witness agreed. Sir John also agreed that, as a class, the power consumer had a better load factor than the light consumer, and the former class had also a better diversity factor.

Then there is a further factor that, as a rule, the power user, as a class, uses more electricity than the light consumer as a class?—As a rule.

All these factors, of course, are circumstances which are taken into consideration in fixing the price?—Certainly; that is why you charge twice as much for lighting as for power.

In so far as the power user has 20 per cent. of light, his load factor is slightly worsened by that percentage?—If he has power alone it is worsened.

SIR JOHN was then cross-examined on the 1914 accounts of the Borough Council with reference to their electrical undertaking, these being the accounts which were placed before him for the purpose of investigation.

On Thursday, last week, MR. A. J. WALTER, K.C. (with him Mr. Spence), for the defendants, submitted that the action was entirely misconceived. It was founded on an entire misunderstanding of Sec. 19 of the Electric Lighting Act (the section which with Sec. 20 plaintiffs complained that the defendants had violated), and of the Long Eaton lighting case which, properly understood, was the authority directly in favour of the present defendants. The plaintiffs came to the Court as the champions of light, though their real business was to sell gas.

His LORDSHIP pointed out that the point between plaintiffs and defendants was as to the relative profit made by the defendants' undertaking during a particular period as between power and lighting. Sir John Snell thought that the power was being supplied at a loss, or, at all events, at a less advantageous rate than lighting.

MR. WALTER said Mr. Merz, his witness, said the business was paying on the power, and the figures showed that in 1916, when the price of coal was up, the defendants converted a loss of something like £8,000 into a profit of over £6,000, although the lighting load had gone down 1,000,000 units.

MR. CHARLES MERZ, consulting engineer, gave evidence for the defendants. He said the capital cost was a considerable item in all electrical undertakings, and the plant must be sufficient to supply the maximum demand. The regularity of the supply was a most important factor in the cost of production of the supply. As between a lighting load running only two hours a day and what was called the high-load-factor consumer, the difference of cost might be several hundred per cent. in a municipal undertaking. Two hours a day was generally known to cover a very large number of lighting consumers. Power users for the purpose of their own businesses desired to have the highest possible load factor; it affected the wages bill and every other item in connection with factory cost, and the load factor was reflected back to the station. There had been a large number of Power Acts passed by Parliament. The North-East Coast group of power companies turned out about one-fifth of the total electricity of the country. Electrical energy was by the Power Acts allowed to be supplied for power purposes, and it followed that it was also necessary to supply light for all the factory purposes, and to allow 20 per cent. of the supply to be used for lighting purposes. The electrical energy supplied took no notice of whether it was supplied for power or light. The result of that was that in all power businesses a large undertaking must seek more and more to supply the manufacturer or factory user who would insist on being able to take his light or power from one set of wires. With regard to the Hackney Borough Council undertaking, witness said the power business was undoubtedly paying in 1913. The lowest charge was ½d. per unit, and the lowest cost was ·348d. The fixed charges amounted to £12,000 per annum, and supposing that power had not been sold, the Corporation would have lost £12,000 right off. He had gone into the question of the actual payments with the view of trying to check the diversity factor. As the power business was the one which had a diversity, that was the one class of business whose combined demand could not be got from the consumer's account, as they did not know the incidence of the lighting demand. The diversity factor of the other business was practically negligible. Losses were higher on the peak, because on a direct-current system there was no loss on low load, though there was an increasing loss on the high load. The system he had adopted of ascertaining the cost was the one usually adopted to get at the rate to be paid by those who took power in the daytime. During the period of non-peak load the losses were less, and it was utterly unfair to charge those losses to the day load. The result of the power business was to put the undertaking in a better position by £12,000 a year.

MR. J. A. JENKINS, accountant of the Borough of Hackney, said the accounts of 1916-17 showed that for lighting 1,825,075 units were sold, and for power and factories 12,465,635, and the amount carried forward was £6,918, without taking into account £14,691 allowance to employés at the war. The net profit was £5,456. That was after meeting every obligation. The capital to date was about half a million. A large sum was paid off capital except in the first two years, and there had been a large contribution to the rates during the period of working the business. A reserve of £24,669 up to March 16th had been created. There was a deficiency only up to 1902. Owing to the large increase in the cost of coal last year, £6,000 had to be debited to reserve.

On Wednesday last MR. JUSTICE ASTBURY delivered judgment, holding that the defendants had not threatened or intended to do anything in breach of the provisions of the Act of 1882. The action therefore failed, and was dismissed with costs. The detailed judgment will appear in our next issue.

ELECTRICITY WORKS FATALITY: COMPENSATION.

AT Bolton County Court, last week, application was made for the appropriation of a sum of £300 which had been paid into Court in connection with a fatal accident some time ago to Georgé Edward Horler, switchboard attendant at the Bolton Corporation's Electricity Works, Back-o'-th'-Bank. On behalf of the widow, Annie Horler, it was stated that there was an unborn child, and its interests would have to be considered when the money was allocated. His Honour sanctioned the payment of £10 down and £3 a month, and asked that the case should be mentioned again when the child was born.

Leaving Certificate Granted.

At the Oldham Munitions Court, last week, an employé of an electricity undertaking asked for a leaving certificate. His wife was in London as a teacher under the London County Council, and he wished to take an appointment there, and so be near her. Each month for the last 11 months he had asked the chief engineer of the works to release him, but each time the request had been refused. It was not a question of money with him, as he would be receiving less in London. A letter from the employers said the applicant was their shift engineer, and he had got married since accepting the appointment with them. The leaving certificate was granted.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

A Revelation Concerning the Ways of Reviewers.

As regards my quotation last week from the remarks of one of your reviewers in the preceding issue, it was clear that about the only defence that could be put forward for those remarks would be that they were made as a joke. In your comments on my letter you make this very excuse for your reviewer; but why not have let him give his own explanation?

Assuming the matter was a joke, may I point out that it was a dangerous sort of joke, being of the type that could be variously described as the boomerang, spring-back, or double-edged. In plain language, your reviewer cited the very procedure which is sometimes adopted by unscrupulous reviewers, and he consequently laid himself under suspicion. A parallel example would be that of a baker who joked about sawdust in flour.

As in the course of the next few months three or four new publications from my pen will be submitted to you, I venture to hope that they will be handed to reviewers who will "get interested" in them.

W. Perren Maycock.

West Norwood, London, S.E. 27,
July 21st, 1917.

[Be it understood that we disclaim all responsibility for the joke referred to; it is coeval with the mother-in-law joke, and we should have thought that every writer of books was familiar with it.—Eds. Elec. Rev.]

WAR ITEMS.

German Control of Electricity Consumption.—The Federal Council has authorised the Imperial Chancellor to exercise control over the production, transmission, and consumption of electricity and gas, as well as of steam, compressed air, and hot and potable water. A department has already been created to carry out the order issued to this effect, which aims at the uniform regulation of the agencies in question.

Trading with the Enemy.—The "London Gazette" for July 20th contains further names of persons and bodies in the following countries with whom trading is prohibited:—Argentina, &c.; Brazil; Chile; Netherlands and Netherland East Indies; Norway; Spain, &c.

Recovering the French Collieries.—We read in the *Times* that Mr. Maurice Deacon, M.I.C.E., has accepted the honorary position of technical adviser to the British Government, in association with the French Ministry of Mines, with regard to the recovery of the French collieries which have been destroyed by the Germans in the Lens coalfield.

Thyssen Profits.—A German newspaper states that the Thyssen Factory, at Mülheim, shows a profit of 14 million marks, with a dividend of 10 per cent.—*Times*.

Hull Electricity Employés and Substitution.—At the last meeting of the Hull Electricity Committee, the acting engineer stated that the Military had asked for six more of their men under the substitution scheme. He had pointed out that it was impossible for them to be released, and if they were taken the authorities would have to take the risk of the undertaking. The matter had therefore been deferred for a time.

Exemption Applications.—At Blackpool Tribunal, it was mentioned that in the cases of 14 employés of the electricity and tramways department it had been agreed with the Advisory Committee that 13 should have temporary exemption to the end of December, and leave to appeal be given in the other case in the event of his being called up. Mr. J. W. Mitchell asked if any Corporation officials sat in these cases, and the Assistant Military Representative replied that they would. He added that all the men were in certified occupations, and the department was working at the lowest possible minimum.

At Aldershot, Messrs. T. White & Co., Ltd., appealed for G. S. Velvick (33, B 1), who has charge of the firm's electric light branch and supervises all the work. The Military objected, as Velvick has had exemption since June, 1916, but three months were conceded.

At Eastbourne, Mr. Brydges, borough electrical engineer, appealed for 12 employés at the works. The cases had been adjourned to see if the men would be protected by the Government, as they were partly engaged on munition work. Mr. Brydges said that the Government would not protect men where the output was less than two-thirds. He contended that all the men were engaged on work of national importance in supplying light and power, even if they did not do any munition work at all. The appeals were respited for further consideration.

On the appeal of the Aldershot & District Traction Co., three months have been allowed to a fitter and driver, six months to another driver, and in the case of a third driver, he was reserved for substitution.

Pershore Rural Tribunal has granted temporary exemption until September 15th to G. Ballard (32), electrician to Lieut.-Col. H. M. C. Porter, of Birlingham, who is on active service.

Extended exemption until the end of the year has been granted by the Nuneaton Tribunal to P. H. Howe (28), electrical fitter, on the ground that he is doing work of national importance.

Before the Hants Appeal Court, the Military appealed against exemption held by H. W. Keeping (40, B 1), electrician, of Shanklin (Isle of Wight). The Military Representative suggested that the business was only a small one, but respondent said that it was established in 1859, and he took it over from his father. He was the only electrician in the town, and did work at the hospitals and nursing homes. The appeal was allowed, the calling-up being fixed for August 7th.

An appeal was made at Peterborough for the retention of T. C. Roskelly (31, Class B 1), electrician to Mr. H. Czarnikow, of Stoke Doyle, who has been previously rejected. The appeal was refused.

A Military review was made at Hastings of the case of R. H. Pattenden, electrician, with Messrs. Upfield & Son. It was stated that Pattenden had a number of electric lifts to look after, and it was suggested by the Military Representative that in war time people might walk upstairs. The Tribunal allowed two months in which to find a substitute.

Bedfordshire Appeals Court has given delay until September 16th to Edward Foster, electric light attendant, appealed for by Captain R. S. Bruce, of The Knolls, Leighton Buzzard.

On the recommendation of the Advisory Committee, Rochdale Tribunal has given exemption until October 31st to R. H. Hogg (37), motorman on the Corporation tramways. The Tribunal has also given exemption until October 15th, on the appeal of the tramway manager, to J. T. Hoyle (34, B 1), controller, examiner, and cleaner, and J. E. Kershaw (36, B 1), traffic clerk and week-end inspector.

Chatham Tribunal has confirmed a previous decision giving conditional exemption whilst holding Ministry of Munition certificates, to five motormen with the Chatham & District Light Railways Co.

At Douglas (Isle of Man), the Military appealed against conditional exemption granted to L. Dyer (27, C 2), electrician engaged at the Manx Brush Factory and elsewhere. The appeal was disallowed, and the exemption confirmed.

The Whitchurch and Pangbourne Electric Supply Co. appealed for further exemption for J. L. Rushby (18), electrical engineer, passed in Class C 3. It was stated that he assisted with the engine switchboard, and often ran the water power alone in the absence of the engineer. There were only two employés left out of five. Six months' conditional exemption was granted.

The cases of three car drivers with the Electric Tramways, Ltd., were considered by the Bath Tribunal. W. Swift (24, C 3) and F. G Atwick (36, C 2), were given conditional exemption; and exemption was refused in the case of G. O. Snell (25, C 2), whose retention was not pressed for by the engineer and manager.

At Oxford, the Military had a review of conditional exemption granted on June 15th to F. M. Stedworthy (38, general service), electrician and fitter with Mr. A. H. Pearson. The latter said that Stedworthy was his last man. Two months were granted.

At Rugby, Mr. W. H. Linnell appealed for H. W. Gilbert (24, Class C 2), the only electrician left on his staff. Captain Wratislaw expressed the opinion that there were sufficient electricians in the town to do the private work. The Chairman said that as the man was a skilled craftsman he would have a code number, and under the circumstances they would dismiss the appeal, and throw the man on the mercy, tender or otherwise, of the Complaints Section of the Munitions Committee.

At Farsley, near Leeds, the Morley Electrical Co., Ltd., appealed for their secretary, Mr. N. Hill, single, aged 29, and classified C 3, and for a foreman winder, H. Moore, aged 26, married. Mr. Hill was stated by Mr. Summerscales, the manager of the company, to be the only man left in the office, and the commercial side of the business was complicated, and it would take a long time to train a new man to the work. He had not been medically examined since being originally passed, but Mr. Summerscales thought he would certainly be in Class A. These two men ran the shop, and

if they were taken it would mean shutting down. The last time Moore was appealed for it was agreed that he was in a certified occupation. The Military Representative said that Moore was not certified on the new list, as armature winding had been removed. In answer to Mr. Summerscales's statement that the firm were on munition work, Mr. Sugden said if they could show they were on munition work they could retain Moore by putting him in a protected trade. Mr. Hill was given to September 30th, and Moore to July 31st.

BUSINESS NOTES.

The South African Electrical Market.—The ordinary household metal filament lamps are scarce, and the price has advanced smartly in consequence. The prospects of getting adequate supplies are anything but bright, as very little electrical goods came out by the last mails. Business is quiet through the shortage of stocks, which requires qualifying. It appears there are plenty of some kinds, but many of the etceteras are lacking, therefore jobs cannot be completed, and another reason is that the Johannesburg municipality is not giving any new (as distinct from old premises) electric light connections. The mines have practically cleared the merchants' stores of electric motors and power plant, as well as cables.—*S.A. Mining Journal.*

Time Checking.—The war has brought many radical changes into the large industrial works of the United Kingdom, and not the least amongst these is the accurate checking of employés' time, the exact regulation of meal intervals, also starting and stopping of work. Messrs. Gent & Co., Ltd., have orders in hand for many munition factories and Government-controlled works for "instituting time circuits" for controlling existing spring-driven workmen's check clocks and other clocks in buildings. By a simple and efficient means, all workmen's check clocks are controlled by their Pulsynetic electric transmitter, thus ensuring correct and uniform time throughout the establishment. The system is so elastic that any number of check clocks or time dials may be added to the circuit as occasion demands, and alarm bells or sirens can be operated automatically to any given programme or programmes. In many instances these programmes vary with the day of the week, and also with the department. All such variations can be dealt with effectively.

Catalogues and Lists.—Messrs. Ferranti, Ltd., Central House, Kingsway, London, W.C.—Pamphlet Ta 174 (10 pages), giving detailed and illustrated instructions for the installation and maintenance of oil-immersed static transformers.

"Z" Electric Lamp Manufacturing Co., Ltd., Southfields, London, S.W.—Specimens of postcards and billheads that have been designed for the use of the trade, and will be supplied overprinted with customers' names and addresses. The billheads are in pads of 100.

Westinghouse Cooper Hewitt Co., Ltd., 80, York Road, King's Cross, N. 1.—List No. 75a (8 pages), dealing with the mercury vapour converter for transforming a.c. General information, tabulated data and prices, and dimensioned diagrams, are given. A special series of rectifiers is now being manufactured for the charging of telephone batteries.

Messrs. J. B. Saunders & Co., Ltd., 91, York Street, Westminster, London, S.W.—Interesting pamphlet on the advantages of overhead mains for the electric lighting of small towns. Only the first few pages contain letterpress, the whole of the remainder giving excellent half-tone photographic views showing overhead electrical distribution work in Carmarthen, Maesteg, Sirhowy Valley, Faringdon, Woodbridge, Whitstable, Braintree, and at a number of military camps.

Trade Announcements.—Mr. F. H. Morley, of Star Buildings, Northumberland Street, Newcastle-on-Tyne, has been appointed representative for the Newcastle district by the New Switchgear Construction Co., Ltd., for the sale of their switchgear and apparatus.

Mr. Frank Fillingham, late of Messrs. Wright & Fillingham, electricians, of 215, Beverley Road, Hull, has commenced business on his own account at 121, Beverley Road.

Book Notices.—"Memoirs of the College of Science of Kyoto Imperial University, Japan," Vol. II, Nos. 1 and 2, have come to hand. The second number contains particulars of a research by Mr. Usaburo Yoshida on the figures produced on photographic plates by electric discharges; an explanation of the mode of formation of the figures is put forward, and a series of beautifully executed reproductions of spark figures is given. The spectra of metals in the extreme ultra-violet are the subject of a research by Messrs. Toshio Takamine and Shigeharu Nitta, and the former, with Mr. Yoshida, also studied the effect of an electric field on the spectrum lines of hydrogen.

"Logarithms for Beginners." By C. N. Pickworth. Manchester: Emmott & Co. Price 1s.—This work is now in its sixth edition. The principal alteration is the addition of a table of logarithmic trigonometrical functions to the collection of tables previously included.

"Indicator Handbook." Part II. By C. N. Pickworth. Manchester: Emmott & Co. Price 3s. net.—This, the sixth edition, contains a new table of mean-pressure factors for different conditions of expansion, and has been revised in other respects.

"Post Office Electrical Engineers' Journal." Vol. X, Part 2. July, 1917. London: H. Alabaster, Gatehouse & Kempe. Price 1s. net.

For Sale.—The Central Electric Supply Co., Ltd., has for disposal one triple-expansion 2,200-I.H.P. non-condensing marine type standard Belliss engine, complete, direct coupled to one 1,460-kw., three-phase alternator, &c. Full particulars are given in our advertisement pages to-day.

Fires.—A fire (damage £500) occurred last week in the electric generating station of Messrs. Samuel Heap & Son, Ltd., Spotland Bridge Mill, Rochdale. The cause was the tipping of hot flue dirt against the door of the building.

A fire occurred last week at the premises of Messrs. Gillett, electrical engineers, Great Market, Newcastle.

The fire which occurred at the works of Messrs. D. H. Bonnella and Son, Ltd., Mortimer Street, W., last Friday, was confined to a portion of one floor. The general operations of the factory are not in any way interfered with.

Holidays.—The works of the Tyler Apparatus Co., Ltd., Banister Road, North Kensington, W. 10, will be closed for the holidays from August 3rd to 13th.

The works and offices of the General Electric Co., Ltd., Witton, will be closed from the evening of Friday, August 3rd, until the morning of Monday, August 13th.

The British Westinghouse Co. announce that, though their works at Trafford Park will be closed from to-day until August 7th for overhauling and repairing the plant, special arrangements have been made in the Receiving Department to accept materials, and also for the despatch of completed apparatus, during that period.

Dissolutions and Liquidations.—Korting Bros., Ltd.—Meeting of creditors August 7th, at 2, Coleman Street, E.C. Liquidator, Mr. A. G. Parker. Cheques for the full amount due to all creditors will be dispatched prior to the meeting date.

Plutte, Scheele & Co., Ltd.—The Controller, Mr. G. W. Roberts, 133, Wool Exchange, E.C., has applied for his release.

Steel's Electric and Engineering Co., Ltd., Poplar.—First meeting of creditors and contributories August 2nd, at Carey Street, W.C.

Wright & Fillingham, electricians and plumbers, 215, Beverley Road, Hull.—Messrs. J. Wright & F. Fillingham have dissolved partnership. Messrs. Walker & Colbeck, 9, Parliament Street, Hull, will attend to debts, &c.

LIGHTING AND POWER NOTES.

Ashton-under-Lyne.—The electricity undertaking, which of late years has made substantial contributions to the rates, will require the provision of about £3,500 this year.

Australia.—The Chief Commissioner for Railways has informed the Newcastle (N.S.W.) Municipal Council that he is prepared to supply electricity for power and other purposes. It is stated the arrangement will obviate the necessity for extending the municipal plant.—*Sydney Daily Telegraph.*

Bath.—At the last meeting of the Council the electrical engineer submitted the tenders for an Underfeed stoker to be fitted to a marine boiler, and a transporter for the conveyance of coal to the stoker. He estimated that £1,000 per annum would be saved by this installation, and the Council decided to expend up to £1,200 on the plant.

Brighton.—Price Revision.—The Electricity Committee has decided that the charge for electricity supplied to all classes of consumers other than power-users within the borough be increased by 10 per cent.; that the flat rate of 6½d. per unit for electricity supplied outside the borough be increased by 10 per cent.; that a meter charge of 2s. 6d. per quarter, payable in advance, be made for each prepayment meter installed; that the charge for electricity supplied to the Corporation tramways be increased from 1·4d. to 1·5d. per unit; that, except in the case of special contracts, the power rates be increased by 10 per cent.—the increased charges to take effect at the expiration of the current quarter. No alteration is to be made in the charge for bulk supply to the parish of Aldrington, and the charge for street lighting is to remain as at present.

China.—A large cotton spinning mill is now in course of erection at Wuchang for a Chinese syndicate. The machinery for the spinning mill, which will be equipped with 40,000 spindles, is to be of the latest pattern, and is to be electrically driven, power being obtained from the Wuchang Electric Light Co. It was found to be impossible, under present circumstances, to obtain the motors from England, and the order has accordingly been placed with the Westinghouse Co., of America. In addition to the spinning mill, it is also proposed to install later a weaving shed with 500 looms.—*Indian Textile Journal.*

The Foochow Electric Light Co. has increased the capacity of its plant from 500 to 1,500 kw., in order to meet increasing demands. The necessary machinery has been purchased from the United States, delivery from England being impossible. This year the company earned 40 per cent. on its capital, and paid a dividend of 13½ per cent. Other small electric light companies are being formed with light Japanese plant at Chuanchou and Sien-yu.

Electric lighting has recently been adopted in the town of Mengtsz, Southern China.

Continental.—Spain.—A concession has recently been granted for the establishment of a plant to utilise the water power of the River Segura, near Ulco (Province of Murcia), in the generation of electrical energy for industrial purposes.

Darwen.—For the year ended March 31st last, there was an adverse balance against the electricity department of £2,631.

Farnham.—The B. of T. has extended the Farnham Electric Lighting (Extension) Order, 1914, by 12 months.

Great Harwood.—Provisional Order.—The U.D.C. has decided to make application to the B. of T. for a renewal of the Electric Lighting Order.

Halifax.—New Plant.—A 6,000-kw. turbine set, costing some £26,000, was officially started last week by Lady Rhondda. Subsequently the guests were entertained at Bankfield, where Mr. James Parker, M.P., congratulated the Electricity Committee on its work, and Mr. Clem. Edwards, M.P., referred to the great industrial developments of the future, which would necessitate the extended supply of electricity.

At a special meeting of the T.C. on Tuesday, last week, it was decided to secure 21¼ acres of land at Copley, as a possible site for a new station, at £3,600, and that expert advice should be obtained on the question of building the station there. Ald. Spencer (a member of the B. of T. Committee on Electricity Supply) pointed out the impossibility of extending on the present site, and stated that the new station would not be built in any case until the proposals of the Government Committee were made known.

The Corporation has appointed Sir John Snell to advise as to the most suitable site for electricity works.

Huddersfield.—Provisional Orders.—The Corporation has notified the Kirkheaton, Marsden, Meltham, Kirkburton, and Lepton U.D.C.'s of the intention of the Corporation to apply, in December next, for Provisional Orders authorising the supply of electricity in those districts.

India.—Cauvery Power Scheme.—The fifth installation of 4,000 h.p. of the Cauvery power scheme at Sivasamudrum Falls will be completed in September next. It will be by far the biggest unit hitherto provided in Mysore. Only a portion of a generator, quite the last piece of machinery received in these days of restricted freightage, says *Indian Engineering*, has just been delivered at the works. It weighs 13½ tons, and was taken along from the railhead at Maddur station, inch by inch, on a 12-ton lorry drawn by 22 pairs of bullocks. The turbine is the biggest ever shipped East.

Kirkcaldy.—Year's Working.—The report of the working of the Corporation electricity undertaking for the year ended May 15th, 1917, shows a total income of £15,321, working expenses, amounting to £10,609, and the gross profit, plus £57 income-tax retained, amounted to £4,768. After deducting interest on capital, £2,557, sinking fund, £2,339, and other charges, £55, totalling £4,951, there is a debit balance of £183. The total number of units sold was 2,314,591; 675,179 units were supplied to the tramways, 230,513 units for lighting, and 1,408,899 for power. The total works cost per unit sold was 1·096d., and the average price obtained per unit sold 1·586d.; the quantity of coal consumed per unit sold was 9·42 lb., against 10·13 lb., the cost being ·565d., against ·628 in 1916. The maximum load recorded was 1,034 kw., as against 950 kw. in the previous year; the load factor was 25·5 per cent., as against 23·3 per cent. The total capital expenditure was £81,316, and sinking fund repayments, £24,426.

Liverpool.—Wages.—The City Council has formulated a new war bonus scale for its employés, ranging from 3s. a week to 12s. for men and 7s. 6d. for women, and including all wages up to £4 a week. Over £4 and up to £400 a year the scale is 15 per cent.

London.—Poplar.—The Electricity Committee recommends that the charges for electricity for lighting be increased by 10 per cent. as from October 1st next. The Committee reports that the net profits of the electricity undertaking for the year ended March 31st last were £12,011, of which £7,702 was available for distribution, £3,059 was recommended for the relief of rates, £1,418 for bonus to staff, and £3,224 for reduction of assets.

The City Corporation proposes to agree to the City of London Electric Light Co. increasing its rates for public lighting by 15 per cent. until a year after the war.

Londonderry.—Mr. J. Christie, engineer and manager of the Brighton Corporation electricity undertaking, has been invited by the authorities to collaborate with the resident city engineer in carrying out the extension of the electricity installation in the shipyard.—*Daily Telegraph.*

Mansfield.—Year's Working.—The annual report of the Electricity Committee for the year ended March 31st shows a gross profit of £7,121, as compared with £7,934 in 1916, and, after payment of interest on loans (£3,133), contributions to sinking fund (£2,366), a net profit remains of £1,664, as against £2,718. Coal has cost about £1,140 more and taxes £200 more than in the previous year, but the expenditure on mains and services has been £2,160 less. An item of £489, balance of income-tax, stands over, there being a question as to liability of payment. The Committee has decided to pay over the sum of £500 to the general district rate, and to appropriate the balance of £1,087 to the reserve fund.

Mytholmroyd.—E.L. Proposals.—Having been informed by the Electrical Distribution of Yorkshire, Ltd., that it is about to make application for lighting powers within the district, the U.D.C. has decided to notify the company that Mytholmroyd does not consent to the proposed prov. order.

Newcastle (Co. Down).—The Urban Council has now accepted the tender of the Irish Towns Lighting Co., Belfast, for the lighting of the town by electricity for the ensuing three years, at £230 per annum.

Norwich.—Year's Working.—The report of the Electricity Committee for the year ended March 31st last, shows gross receipts amounting to £57,487, working expenses amounting to £39,293, and after meeting financial charges, &c., the sum of £7,011 was carried to appropriation, as compared with £4,503 in the previous year. From the appropriation account £271 was paid for sub-station premises, £2,283 carried to depreciation, and the balance carried forward. The output advanced by more than 1½ million units to a total of 9½ million units in the year. It was decided to reduce the charge for public lighting to one-third (a saving of £1,100 per annum), which, with the extra cost of labour, represented the proceeds of the extra 5 per cent. added to current charges. It was also decided to obtain a 3½-ton electric wagon from Messrs. Ransomes, Sims, & Jefferies.

Nuneaton.—The Electricity Committee has considered the question of a site for a new generating station, and has recommended the Council to purchase about 3½ acres adjoining the Corporation pumping station, at a cost of £1,200.

Rotherham.—The Sheffield Corporation has given notice to the R.D.C. of its intention to apply to the B. of T. for an Order for the distribution of electricity within the Council's area.

Rochdale.—New Plant.—The Corporation Electricity Committee recommends the installation of three new mechanical stokers of the Babcock type at the generating station, at a cost of about £6,000. The L.G.B. has approved a loan of over £20,000 for extensions to the buildings and plant, and some of this work is already being carried out.

Sutton (Surrey).—The South Metropolitan Electric Tramways and Lighting Co. has informed consumers that the minimum charge of 13s. 4d. per quarter, hitherto not enforced, has been put into operation.

Tunbridge Wells.—Year's Working.—The working of the electricity undertaking for the year ended March, 1917, resulted in a total revenue of £15,205, working costs amounting to £8,547, and a gross profit of £6,659, as against £7,214 for the previous year. Interest and repayment of capital dropped from £6,615 to £6,112, leaving a net surplus of £545 against £598. The output in units sold increased from 1,095,874 to 1,188,478; power and heating accounted for 612,073 units, as against 464,690, and the lighting units were 576,405, as against 631,184. There were 317 kw. connected during the year, bringing the total connections to the mains up to 4,164 kw. Some 238 tons less coal were burnt and 173,464 extra units generated. The coal used per unit generated dropped from 6·1 to 5·1 lb., the coal cost per unit sold was reduced from ·96d. to ·89d., and these results were obtained without any increase on the pre-war charges.

West Bromwich.—Year's Working.—The annual report of the Corporation's electricity undertaking shows that the receipts were £32,047, compared with £24,173 in the previous year. The expenditure on trading account was £29,458, an increase of £8,403, and the gross profit was £2,589, a decrease of £528. Loan charges amounted to £7,285, and there was a net loss of £4,696. The balance remaining in the reserve fund was £2,162. The scale of charges had been advanced during part of the year, but these, it was stated, had not been sufficient to meet the additional cost of manufacture caused by the constant advance in the price of coal, wages, repairs, and maintenance. The Committee recommended further increases in the price of electricity for lighting and motive power purposes as well.

West Ham.—Year's Working.—The total income of the electricity undertaking for the year ended March 31st last was £157,148, as compared with £143,611 in the previous 12 months. The total expenditure on revenue account amounted to £140,037, as against £120,066 in the previous 12 months. Including repayment of loans, contributions to sinking fund, and interest, there was a net deficiency of £35,424. The borough treasurer says it is important to consider whether the revised charges still to be put into operation are adequate to meet the case, especially when it is borne in mind that the major portion of the supply is for power for private trading, and that substantial deficits are being charged against the rates—the deficit for this year alone, after deducting allowances to men on active service (£4,612), representing a rate of about 6d. in the £. The Committee is further reminded that there is no reserve or renewal fund to meet any further demands for replacements of any portion of the assets required before the expiration of the loan periods.

Willesden.—There was a surplus of £1,614 on the net revenue account of the electricity undertaking for the year ended March 31st, 1917. The electrical engineer has been instructed by his Committee to point out to the Government Departments concerned conflicting instructions issued by them. It appears that the Priority Branch of the Ministry of Munitions, on July 5th, 1917, prohibited the installation of any new plant without a permit, whereas a letter from the Coal Controller urged the installation of electric heating and cooking apparatus to effect economy in the consumption of coal,

TRAMWAY and RAILWAY NOTES.

Australia.—The employés of the Western Australian Government Tramways are dissatisfied with the result of the recent arbitration award. The Court gave an increase of wages which they expected to be retrospective to December 19th, 1916. The Railway Commissioners have declined to accept this date, and have applied to the Court for an interpretation of the retrospective clause.—*Sydney Daily Telegraph.*

Bradford.—At a meeting of the Tramways Committee it was reported that all claims arising out of the tramway accident at Wyke, last January, had now been settled, the total cost amounting to £2,377.

Continental.—RUSSIA.—It is stated in the *Novoye Vremya* that the Minister of Ways of Communication has instructed the engineer, G. E. Graphto, to report on the possibility of introducing electric traction in some sections of the Russian railway system, to take the place of steam. This is no doubt due to the present lack of fuel and the prospective scarcity of it in some parts of Russia, even after the war.

PORTUGAL.—In the course of recent labour troubles at Lisbon, the tramway service has been completely stopped.

Darwen.—There was a deficiency of £2,806 on the tramways undertaking for the year ended March 31st last.

Huddersfield.—The manager having reported on the advisability of doubling the track on the Bradley section, the Tramways Committee has decided that application be made for authority to purchase the necessary materials.

Kirkcaldy.—YEAR'S WORKING.—The annual report of the Corporation tramways department for the year ended May 15th, 1917, shows a total income of £18,816, working expenses amounting to £12,707, and a gross profit of £6,109; after deducting interest, sinking fund, and other charges, amounting to £5,690, there remains a credit balance of £418. The passengers carried amounted to 5,272,292, a reduction of 130,916. Ordinary halfpenny fares were abolished in September, 1916, and the traffic receipts have increased by £1,377 over the previous year. The average traffic receipts per car-mile were 10·152d., and operating costs 7·01d. per car-mile.

Leeds.—WOMEN INSPECTORS.—The proposed appointment of female tramway inspectors is understood to be not favourably received amongst a large section of the employés, and women conductors are amongst the strongest opponents of the idea. The workers concerned object that these jobs should be given to men with long experience in the service, and to men who have come to the tramways from the Army. The employés have taken the matter to their Union, of which most of the women conductors are now members, and the Union has put its views before the Tramways Committee.

Londonderry.—PROPOSED ELECTRIC CARS.—At the meeting of the Corporation, on Monday last, a resolution was passed in favour of obtaining powers to run electric railless trolley vehicles, or, in the alternative, motor-buses or electric cars. The general opinion was that the city should have a more up-to-date means of street locomotion.

Manchester.—WAGES AWARD.—The Commissioners of the Committee on Production who inquired into the application of the employés of the Corporation for an increase in the war bonus of 2s. 6d. awarded them on June 11th last, have decided that the workpeople have not made out any case for such advance. The text of the award is as follows:—"The Committee on Production on July 16th heard representatives of the Manchester Corporation and the Manchester Corporation tramway workers, and gave the fullest opportunity to enable the employés to give particulars of any difficulties relating to the advance given under the finding of June 11th, and of any special conditions that may operate in Manchester, and having heard the representatives of the Corporation in reply, the Committee's decision is that the case presented to them differed in no material particular from that put forward for hearing on June 8th, and offered no reason for a departure from the award of June 11th." When the Minister of Labour intervened in the Manchester tramway dispute on July 6th the employés at a mass meeting decided to abide loyally by the decision which would be reached as the result of his intervention.

Salvador.—H.M. Consul reports that a British subject has secured a concession to operate electric street cars, for a term of 75 years, in San Salvador and its suburbs. The track is to be of the groove type, and the length of the proposed lines, which will replace the existing mule tramway lines, will be 18 km. (about 11 miles). The concessionaire has the right to increase the track to 50 km. (about 31 miles) later. The State will subsidise the new lines.—*Board of Trade Journal.*

South Africa.—The revenue of the Johannesburg municipal tramways for the year ended March last was £35,000 and the profit £6,351. The average working profit per car-mile was 10·21d., compared with only 7·25d. in the previous year.

Southend-on-Sea.—The Tramways Committee has considered the question of providing and fixing a safety device for arresting the fall of trolley booms which may leave the overhead equipment, and has instructed the electrical engineer to provide his safety device upon each of the cars, at an estimated cost of £3 10s. each. The electrical engineer is to report as to the practicability of running a service of through cars from Leigh to Southchurch and to the Beach.

Tynemouth.—PROPOSED TRAMWAY DEVELOPMENT.—The T.C. is considering a scheme for the development of that portion of the Tynemouth and District Electric Tramway Co.'s undertaking which lies in the borough, and which, in March, 1920, it will have the option of purchasing. The present line runs from the New Quay, North Shields, to the end of the Grand Parade, Tynemouth. A Sub-Committee, specially appointed, considered the matter, and recommended that a scheme be provided for a service to connect the several residential areas with the railway station, the shopping district, public institutions, places of worship and entertainment, works, the ferries, and the coast; to link-up the borough with Newcastle and the interlying districts; and to facilitate the development of unbuilt areas which are not now easy of access. The present narrow-gauge system is condemned as unsatisfactory, and it was held that the gauge should be the same as the Tyneside Co.'s system to facilitate through services. The scheme also outlined five different routes. The subject is at present before the Trade and Commerce Committee.

U.S.A.—A recent issue of the *Railway Gazette*, discussing the operating results of the electrified Elkhorn division of the Norfolk and Western Railroad, says the system is a single-phase 11,000-volt, 25-cycle distribution to the trolley, the locomotives being equipped with phase converters and step-down transformers, which convert the single-phase to three-phase energy for use in induction type motors. Electric operation resulted in increasing the speed from 7 to 14 M.P.H., the traffic being mineral. The loco.-mileage increased from an average of 60 under steam to 100 with electric locomotives, per day; practically, the latter can run 24 hours per day. As a result, the number of locomotives dealt with at Bluefield has been reduced from 17 steam to 5 electric, and banking engines from 7 steam to 2 electric. The number of steam locomotives required to deal with the maximum day's traffic was 43, but the heaviest day with electric working was handled by 9 locomotives. Under electric working an increase of 25 per cent. in loaded cars going east, occurred over steam working in 1914; but a decrease of 48 per cent. in engine-hours occurred, despite this. The electric locomotives have not only increased the capacity of the line by 100 per cent., with a considerable reduction in operating costs, but are likewise paying a return on the net cost of the installation.

West Ham.—YEAR'S WORKING.—The income of the tramway undertaking for the year ended March 31st last amounted to £166,142, as against £164,110 in the previous 12 months. The expenditure came to £149,989, as against £124,926 in the 12 months' ended March 31st, 1916. Deducting interest, repayments of loans, renewals to permanent way, &c., and £16,670, allowances to men on active service, the deficit for the year was £41,197, as against a deficit last year of £10,462. The borough treasurer, in submitting the above figures, suggests that immediate consideration should be given to the question whether the present basis of charge for traffic revenue is sufficient. He points out that after taking in the deficiency for this year, the total either charged or chargeable to rates amounted to £71,026, in addition to which there was a short payment in respect of rates during the period from the commencement to 1909, when the undertaking was not fully rated.

Wolverhampton.—WAGES ARBITRATION.—The award of the Chief Industrial Commissioner, in the differences between the Corporation and its employés on the tramways, is an advance in wages of 5s. per week to workers of the age of 18 and upwards, and 2s. 6d. per week under that age, to take effect as from April 1st. Time and-a-quarter is to be paid to members of the traffic staff in respect of all hours worked on week days in excess of 10, and time and-a-half paid for Sundays in respect of Sunday excursion and other special cars run outside and beyond the ordinary Sunday working hours. The case of cleaners and other night workers is left for the consideration of the Corporation.

TELEGRAPH and TELEPHONE NOTES.

Brave Wireless Operator.—The Rear-Admiral Commanding the British Naval Forces in the Adriatic has forwarded to the Admiralty the wireless telegraph logs of H.M. trawler *Floanda*, as an exhibit for the National War Museum. This log was found in a damaged condition in the wireless operating cabin of H.M. drifter *Floanda* after an attack on the drifter line by three Austrian cruisers in the Adriatic on May 15th last. The wireless operator, Douglas Morris Harris, R.N.V.R., continued to send and receive messages, although the drifter was being riddled by shells, until he was killed by a piece of shrapnel whilst writing in the log. Before joining the Navy, Harris was engaged on the clerical staff of the Wolverhampton Corporation Electricity Department for a period of nearly three years.

Halifax.—At Halifax Juvenile Court, last week, five boys were fined £1 each for throwing stones at telegraph insulators. The Magistrate intimated that future offenders in this way would receive more severe punishment.

Secret Wireless in Norway.—The police have discovered two secret wireless stations in Norway. One was at Haugesund, in a bower in a small forest, and the other on an island at Arendal.—*Daily Telegraph.*

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—SYDNEY.—August 22nd. N.S.W. Government Railways and Tramways. Thirty-six induction motors (Specification No. 488). September 19th.—One 225-H.P. synchronous motor (Specification No. 489). Particulars from Electrical Engineer's Office, 61, Hunter Street, Sydney.

MELBOURNE.—October 10th. Department of the Navy. Pumping plant and equipment for the Commonwealth Naval Dockyard, Cockatoo Island, Sydney. Specifications from the Director of Navy Contracts, Melbourne.

Blackburn.—August 4th. Steam coal for 12 months for the Electricity Department. Mr. P. P. Wheelwright, Engineer and Manager.

Ilford.—July 31st. Electricity Department. Two rotary or motor converters, 4,400 yards E.H.T. cable, 3,600 yards stoneware conduit. See "Official Notices" July 20th.

Keighley.—August 3rd. 12,000 tons best slack and small slack coal for Electricity Department. Six-monthly and twelve-monthly period. Mr. H. Webber, Boro' Electrical Engineer.

Warrington.—August 14th. 7,500 tons of slack coal for the Electricity and Tramways Committee during six months from September 10th, 1917, and alternatively for part or whole of 15,000 tons of slack during 12 months. Mr. F. V. L. Mathias, Borough Electrical and Tramways Engineer, Howley, Warrington

CLOSED.

Australia.—MELBOURNE.—Electricity Supply Committee. Accepted tenders :—

699,000 carbons, £2,629.—Beacon Carbons, Ltd.
260 cast-iron boxes, £508.—Cleveland Engineering Co.
150 contact suspension gears, £337.—Lawrence & Hanson Elecl. Co., Ltd.
10,000 metal-filament lamps, £667.—Aust. General Electric Co.
1,700 gas-filled metal-filament lamps, £1,206.—Aust. General Electric Co.
Meters.—Group A, £500, ditto B, £67, ditto D, £90: British Westinghouse Manufacturing Co. Group C, £1,228: Reason Manufacturing Co.
—*Tenders.*

Government Contracts.—List of new contracts placed during June, 1917 :—

WAR OFFICE.

X-ray apparatus and accessories.—F. R. Butt & Co., Ltd.; Cavendish Electrical Co., Ltd.; H. W. Cox & Co., Ltd.; A. E. Dean; Edison Swan Electric Co., Ltd.; Everett, Edgcumbe & Co., Ltd.; Medical Supply Association; Watson & Sons (Electro-Medical), Ltd.; White Electrical Instrument Co.
Electric bells.—Cox-Walkers, Ltd.; Peel-Conner Telephone Works, Ltd.
Bridge meggers.—Evershed & Vignoles, Ltd.
Cells (electric).—Siemens Bros. & Co., Ltd.
Insulator cups.—T. De la Rue & Co., Ltd.; Litholite, Ltd.
Electric light fittings and accessories.—Edison Swan Electric Co., Ltd.; General Accessories Co., Ltd.; General Electric Co., Ltd.; J. Sax and Co., Ltd.
Galvanometers.—R. W. Paul.
Copper wire.—Callender's Cable & Construction Co., Ltd.
Electric wire.—British Insulated & Helsby Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connolly Bros., Ltd.; W. T. Glover and Co., Ltd.; Liverpool Electric Cable Co., Ltd.; London Electric Wire Co. & Smiths, Ltd.; Midland Electric Wire Co., Ltd.; St. Helens Cable and Rubber Co.; Ward & Goldstone.
Works services.—Installation of electric light: Ellis & Ward, Ltd.

POST OFFICE.

Telegraph apparatus.—Automatic Telephone Mfg. Co., Ltd.; I.R., G.P. and Telegraph Works Co., Ltd.; W. G. Pye & Co.; R. Stafford, Tyne and Co., Ltd.
Telephone apparatus.—British L. M. Ericsson Mfg. Co., Ltd.; General Electric Co., Ltd.; Peel-Conner Telephone Works, Ltd.; Western Electric Co., Ltd.
Telegraph cable.—General Electric Co., Ltd.; Henley's Telegraph Works Co., Ltd.; Siemens Bros. & Co., Ltd.; Telegraph Construction and Maintenance Co., Ltd.; Western Electric Co., Ltd.
Cells.—Siemens Bros. & Co., Ltd.
Arm grips.—Bayliss, Jones & Bayliss, Ltd.
Terminal irons.—Walls, Ltd.
Glow lamps.—British Thomson-Houston Co., Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.
Distribution cable plugs.—B.I. & Helsby Cables, Ltd.
Stay rod.—Bayliss, Jones & Bayliss, Ltd.
Insulator spindles.—Bullers, Ltd.
Cable suspenders.—E. & J. Richardson.
Bronze wire.—T. Bolton & Sons, Ltd.; B.I. & Helsby Cables, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co. (incorporated in the London Electric Wire Co. & Smiths, Ltd.).
Copper wire.—T. Bolton & Sons, Ltd.; B.I. & Helsby Cables, Ltd.; Elliott's Metal Co., Ltd.; R. Johnson & Nephew, Ltd.; F. Smith and Co. (incorporated in the London Electric Wire Co. & Smiths, Ltd.); Shropshire Iron Co., Ltd.; J. Wilkes, Son & Mapplebeck, Ltd.
Galvanised-iron wire.—Dorman, Long & Co., Ltd.; Rylands Bros., Ltd.; Shropshire Iron Co., Ltd.
V.I.R. wire.—Union Cable Co., Ltd.
Laying pipes and ducts, Whitehall, S.W.—J. Mowlem & Co., Ltd.
Two electrically-driven fans at Great George Street, S.W.—Sturtevant Engineering Co., Ltd.

Johannesburg.—Council. Tenders for 25 commutators for tramcars :—

Rand Electrical Co., £37 each; eight in four weeks, balance five weeks later (made in Johannesburg).
British Mining Supply Co., £12 7s. 6d. each; 14 weeks, subject to Ministry of Munitions (made in London, Clare & Co.).
Hubert Davies & Co. (accepted), £11 8s. each; 12 weeks at makers' works, subject to priority certificate (made in England, Dick, Kerr and Co.).

Tenders for 10,000 carbon brushes for tramcar motors :—

Stanton & Co., 2·86d. each (made in England).
Hubert Davies & Co. (accepted), 3d. each (made in England).
Griffin Engineering Co., 3·24d. each (made in France).
R. H. Gould & Co., 3·42d. each (made in France).
Rintoul & Davis, 5¼d. each (made in France).

Newport (Mon.)—Electricity Committee. E. Green and Son: Alterations and additions to fuel economiser, £741.

New Zealand.—WELLINGTON.—The Public Service Stores Tender Board has received the following tenders for 100 miles of 1/18 rubber-insulated wire :—

P. R. Baillie & Co.	(accepted)	£2,800*
Richardson, McCabe & Co., Ltd.		2,397
P. R. Baillie & Co.		2,474
E. W. Cardale		2,585
Tolley & Sons, Ltd.		2,750
F. W. Markmann		3,764
Turnbull & Jones, Ltd.		3,000

* Delivered from Australia.
—*N.Z. Shipping and Commerce.*

Weymouth.—T.C. Coal for the electricity works :—

G. Bryer Ash.—Best through steam coal, 24s. 9d. per ton; best Writhlinton small coal, 21s. 9d. per ton; Gwaun Cal Gurwen washed anthracite nuts, £2 2s. per ton; Ponthenry washed anthracite nuts, £2 2s. 6d. per ton, delivered free into bunkers.

NOTES.

Federated Labour.—The *Daily Telegraph* states that the organisation of the National Federation of General Workers is now complete. Mr. Clynes, M.P., has been elected president of the Federation; Mr. J. N. Bell (Newcastle), vice-chairman; and Mr. J. O'Grady, M.P., general secretary. The Federation represents a number of labourers' unions, with a total membership of a half a million.

Cleaning Insulators.—In the article published in our issue of June 22nd on this subject, the use of Quebracho was strongly recommended. As this substance—a boiler composition, obtained from Argentina—may not be generally known, we may say that it is obtainable from the sole British agents, Messrs. McArthur & Co., Tower Buildings, Liverpool.

Employment of Disabled Soldiers.—The steps that have been taken by the Institution of Electrical Engineers and other public bodies to provide for the training of disabled fighting men, to enable them to perform the duties of switchboard and sub-station attendants, have been from time to time recorded in our pages. Needless to say, the training is intended for the benefit of men from the ranks who have not had the advantage of a thorough education and have been rendered unfit to follow their former callings by injuries sustained in the war. We note with surprise, therefore, that a municipal undertaking is advertising for invalid young officers to act as switchboard attendants, at a salary, inclusive of war bonus, of 37s. a week.

Without wishing for a moment to disparage the capabilities and merits of the lower ranks who have suffered for their country, we cannot help feeling that this offer borders upon an insult to the men who have been judged fit to lead their platoons and companies "over the top," who have received a liberal education, and who in civilian life have occupied positions of trust and responsibility. Have we nothing better to offer to our disabled officers than work which, in many cases, is now performed by women after a few weeks' training? And is it right, on the other hand, that the men who have the first claim on such appointments should be put into competition with officers, against whose qualifications they would have no chance?

The proposal appears to us to be in every aspect inappropriate and ill-advised, and we trust that its originators will realise that an error has been made in putting it forward.

An Industrial Training College.—Messrs. Lever Bros. have just established at Port Sunlight a staff training college, which is a model of its kind and an object-lesson to other great industrial concerns. The college has an advisory committee, a competent principal, and a board of studies consisting of experts.

The scheme has the unique feature of training the staff in the firm's time, instead of in the evening in the employé's time. One branch of the college comes under the head of technical and the other commercial. The technical branch has a staff of experts dealing with electrical matters, building, chemistry, engineering, and printing, the sub-sections including teachers in drawing, mathematics and physiography. On the commercial side there are expert teachers in accountancy, finance, buying and selling, and secretarial practice, the subjects under this branch including English, correspondence and office routine, commercial geography, arithmetic, typing, shorthand and book-keeping. The college staff consists altogether of 28 under the direction of Principal J. Knox, M.A. We hope that Messrs Lever Bros.' example will be followed by other large industrial establishments.—*Daily Chronicle.*

Volunteer Notes.—County of London Volunteer Engineers (Field Companies).—Headquarters, Balderton Street, Oxford Street, W.

Orders for the week, by Lieut.-Colonel C. B. Clay, V.D., commanding:—Officer for the week, Platoon Commander P. Bowden.

Monday, July 30th.—Technical instruction (searchlight) for No. 3 Company, Right Half Company, at Regency Street. Drill, No. 3 Company, Left Half Company. Signalling Class. Recruits' Drill, 6.30.

Tuesday, July 31st.—Lecture, 6.30. Physical drill and bayonet fighting, 7.30.

Wednesday, August 1st.—Drill and elementary bridge construction, No. 1 Company, Left Half Company.

Thursday, August 2nd.—Drill and elementary bridge construction No. 2 Company, Left Half Company. Ambulance Class.

Friday, August 3rd.—Technical instruction (searchlight) for No. 3 Company, Left Half Company, at Regency Street. Drill, No. 3 Company, Right Half Company. Signalling Class. Recruits' Drill, 6.30.

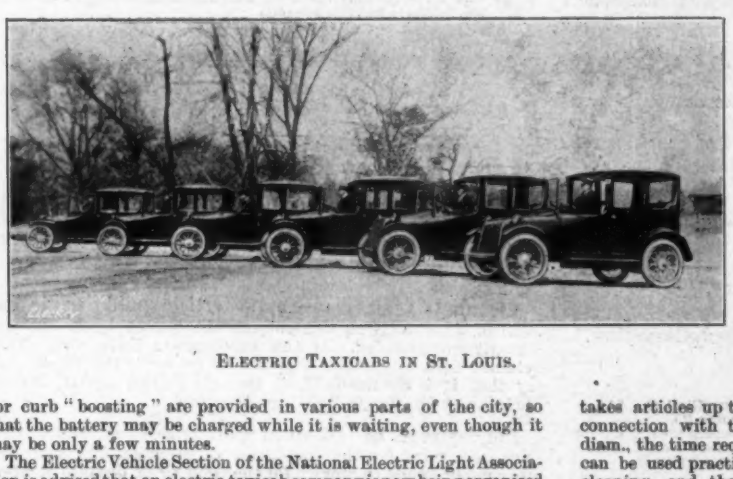
Saturday, August 4th, to Monday, August 13th.—A camp will be held at Esher from August 4th to 13th. Parade at Waterloo, opposite No. 10 Platform, on Saturday, August 4th, at 2 p.m.

Headquarters.—Headquarters at Balderton Street closed August 4th to 13th. Headquarters will be transferred to Claremont Park, Esher, for that period.

Holiday Addresses.—These must be given in to the Orderly Room without fail.

Macleod Yearsley, *Company Commander and Adjutant.*

Electric Taxicabs in the U.S.A.—The most recent installation of electric taxicabs, which have met with phenomenal success in Detroit, is in St. Louis, where six cars make up the nucleus of a fleet. The clean, silent, smooth-running, attractive electric taxicab has made a strong and immediate appeal, and has proved itself to be extremely well fitted for this service, especially because of its low operating costs and its simplicity of operation through congested streets, ensuring safety to its occupants. The mileage of these "electrics" is practically unlimited, as facilities



Electric Taxicabs in St. Louis.

for curb "boosting" are provided in various parts of the city, so that the battery may be charged while it is waiting, even though it may be only a few minutes.

The Electric Vehicle Section of the National Electric Light Association is advised that an electric taxicab company is now being organised in Mexico City, and it is interesting to note that whereas the electric taxicab met its first success in Detroit, the home of the gasoline car, it is now to compete with the gas car in the vicinity of hundreds of oil wells.

Apart from the generally appreciated virtues of the electric taxicab, it is cosmopolitan, for we also find it in successful operation in Shanghai, China, where it has to a great extent replaced the quaint and quite inexpensive jinricksha.

Progress is being made in the provision of an initial fleet of about 500 electric taxicabs of the most advanced type, which it is intended to install in New York City.

Westinghouse Turbo-Alternators.—With reference to our article on this subject in our last issue, we find that the endeavour to squeeze the essence of the pamphlets reviewed into the space at our command has resulted in a loss of accuracy in the following respects:—While the British Westinghouse Co., as stated, have taken out licences to manufacture under the Rateau patents, and have adopted the impulse principle for their standard machines, the American Westinghouse Co. still manufacture the "drum and disk" type. In cases where no advantage is to be gained by the use of the velocity wheel on the high-pressure end of the turbine, it is not provided, the turbine rotor then consisting throughout of wheels having single rows of blades. The over-speed device not only closes the main governor valve by releasing the oil pressure in the relay cylinder, as stated, but also trips the external stop valve, which is shut down by a spring. The statement that small turbines can compete with the high-speed steam or gas engine in price and efficiency, which we reproduced from the pamphlet, requires modification; the makers now point out that such machines present many advantages when used on board ship or for driving auxiliaries in large power stations, since they do not require internal lubrication, the exhaust steam is therefore free from oil, and the heat contained in the exhaust can be most advantageously utilised in a feed heater. But apart from this, considered independently on their merits as producers of power, small turbines of the type in question are not considered as economical as high-speed steam or gas engines.

Department of Scientific and Industrial Research.—The offices of the above Department (including the Fuel Research Board) have been removed to 15, Great George Street, S.W., which is nearly opposite to the Department's present offices. Telegraphic address: "Resciendus, Parl., London." Official telephone number as before—Victoria 7940 (two lines).

Electric Light Switching.—Messrs. Lundbergs' examinations have the advantage that the papers may be worked at home, in camp, or on board ship, whenever there is any available leisure. Any of these papers may be had on application to the firm at 477—489, Liverpool Road, London, N. 7, and the answers may be submitted as soon as worked. The papers are revised from time to time, and we have just received a new Intermediate Grade paper which, we are told, contains an entirely fresh set of problems. There are 12 questions in all, and as the examinee is not allowed to tackle more than nine of them, and need only attempt seven, he has a wide choice.

The Wild-Barfield Steel-Hardening Process.—The Wild-Barfield patent process of steel hardening as worked by the Westminster Electrical Testing Laboratory, to which we recently referred, was described in the last issue of the *American Machinist*. Electrical resistance furnaces are used; the gauge or other article is heated in one bath and quenched in another, special salts being used in each case. The heating bath has both an ordinary heating coil and in addition an outside winding of small-diameter wire, which is simply connected direct to a galvanometer. The main winding, besides forming a source of heat, also magnetises the object to be hardened. The temperature required is determined approximately by means of a thermo-couple pyrometer. Quenching does not depend on this, however, but on the firm's pyroscopic detector. At the temperature correct for quenching, carbon steel becomes non-magnetic, and the collapse of the magnetism produces an electromotive force in the outer winding, and thus causes a deflection of the galvanometer needle, the deflection persisting for the whole time during which the steel is passing through the decalescence temperature. As soon as the galvanometer needle returns to zero, the steel is removed from the heating furnace and quenched. By heating the steel quickly in the bath, the minimum of surface decarbonisation and oxidisation occurs, with also the minimum of viscous flow on the surface of the article, and therefore of change of form. The quenching mixture employed has a high vaporising point, and therefore does not produce vapours, giving even cooling with even hardening effect and prevention of distortion. This, of course, contrasts with the use of water for the same purpose, the water giving off steam. The furnace takes 1,300 watts when fully at work and 600 watts standing, and this, with energy at 1d. a unit, is said to work out at about 2s. a day, continuous working. The furnace shown at a recent demonstration takes articles up to 2 in. diam. The demonstration was made in connection with the hardening of a thread gauge of about ¾ in. diam., the time required in the heating bath being 1¼ min. Gauges can be used practically direct from the bath, requiring no special cleaning, and the only visible effect of hardening is to render them black instead of bright in appearance.

Sentence.—At the Acton Police Court, last Friday, Harry H. Sheppard, 45, an electrical engineer, was sentenced to four months' imprisonment with hard labour for stealing electric fittings valued at £70 8s., the property of his employers, Messrs. C. A. Vandervell & Co. Defendant had been in the firm's service for a year and 10 months, and his wages, with war bonus, were £4 6s. per week. He was in the employ of the Sheffield Corporation for some years, and had never been in trouble before. The goods were taken for his small business at Hammersmith, and his friends attributed the present case to worry, trouble, and illness in his family.

B. of T. Committee on Electrical Supply.—The Association of Municipal Corporations has sent out a circular letter with regard to the B. of T. Committee on Electrical Supply. The Association states that three witnesses have been nominated by the Association to give evidence before the Committee, from the city of Leeds and the boroughs of Blackburn and Sutton Coldfield respectively, the inquiry being obviously one of great importance to those municipalities who own electrical undertakings, and points out that the following, amongst other questions, will probably come under consideration:—(*a*) The question of forming entirely new and large areas of supply and distribution, irrespective of existing municipal boundaries; (*b*) the question of the constitution of the managing body to deal with the supply in each of these areas. The Association asks to be furnished with any observations which Councils think would be useful for their witnesses to have.

Air Raid Warnings.—Writing to the *Times*, Mr. W. H. Allen says that when it is determined whether sounds or scenes should prevail, there will be no difficulty about the former. Steam is absent from the City and County of London, while electric current is everywhere. A large diapason tube with a touch of gamba in it, supplied with compressed air from a motor-driven compressor, will reach large areas, and can easily be put up in the fire stations of the various municipalities.

Prohibited Exports.—The supplement to the *Board of Trade Journal* of July 26th contains complete lists of articles which, according to the latest information received by the Board of Trade, are prohibited to be exported from the Straits Settlements, Hong-Kong, Nigeria, Jamaica, Barbados, Trinidad and Tobago, and British Guiana.

Symbols for Electrical Tenders.—In accordance with a report of the City Electrical Engineer as to the method of comparison of the merits of tenders received for the supply of electrical plant, involving a valuation of a difference in electrical performance, the Sydney Municipal Council has approved of the following as an equation to express the relation between the capital expenditure and the annual cost involving the variables which enter into the calculation :—

$$x = y\left[\frac{(1+b)^n - 1}{b - a + a(1+b)^n}\right]$$

in which the symbols have the following significance :—

x = the capital sum, *i.e.*, the excess capital value of the higher-priced apparatus.
y = the annual excess cost of using the less efficient apparatus.
n = the number of years estimated to be the life of the apparatus.
a = the rate of interest payable for loans at the date of purchase, expressed decimally (*i.e.*, 5 per cent. would be expressed as ·05).
b = the rate of interest obtainable on sinking funds.

Post-War Foreign Trade Competition Measures.—Ever since the European war started in the summer of 1914, says the *Electrical World*, countless rumours have gone out regarding the action that was to be taken by German industries in foreign trade after the war was over. The most persistent rumour has been that German goods would be dumped upon the markets of the world in such quantities as to flood them.

The dye manufacturers of the world know full well the methods employed by the German dye manufacturers to secure the control of the dye industry of the world. It amounted to nothing more or less than putting German goods on foreign markets to be sold at a price less than it cost the domestic manufacturer to produce goods of similar quality. Of course, the German manufacturers were losing money on the transaction, but they had prepared for it for a long time, and had laid up a reserve to be used for just such a campaign. As a result it was not long before the German manufacturers had this market in their control, and when the war broke out the world found itself at a loss to secure sufficient materials of this character.

Recent investigations show that the German electrical manufacturers have undoubtedly something of the same kind in mind for foreign trade competition after the war is over. It is now definitely known that certain of the more important German electrical manufacturers have since the war began been accumulating large surpluses designated as reserves to be used in after-the-war commerce.

Right now American and English manufacturers are enjoying practically the entire foreign trade of the world in electrical goods, but their prices are high, particularly those of American-made goods. The American foreign trade in electrical goods has virtually doubled since the war began. In order to retain this trade after the war German competition will have to be met, and if the above indications are finally borne out, then it becomes evident that American manufacturers must employ some similar measures in order to protect their interests in foreign trade as soon as the war is over. American manufacturers are now enjoying a larger business than ever before, and are in a position, generally speaking, to lay aside sufficient reserve for just such a contingency.

Educational.—University of Manchester.—We have received the prospectus of University courses in the Municipal School of Technology for the session 1917-18. Prof. Miles Walker is head of the Department of Electrical Engineering, assisted by Mr. J. L. Langton and Mr. A. H. Moore. The electrical equipment includes four 100-kw. steam dynamos and a 50-kw. turbo-generator, 100 motors aggregating 1,250 h.p., and a large number of experimental generators, motors, rotary converters and transformers, besides an ample equipment of instruments, &c.

Wire Lamp Patents in Germany.—It is reported in the German newspapers that the Imperial Court has now given a definite decision in favour of the A.E.G. in the matter of Patent 269,498 for the manufacture of wolfram (tungsten) wire for lamps. The company in question acquired the patent for Germany some years ago from the United States General Electric Co., and then made an interchange of working rights with the Siemens & Halske Co. and the Auer Co., whilst a licence was subsequently granted to the Bergmann Co. The validity of the patent was contested by a competitive group consisting of the Pintsch Co., the Radium Co., the Bergmann Lamp Co., &c., and the proceedings have extended over a period of five years. As mentioned, the highest Court has now maintained the validity of the patent, and dismissed the application for a declaration of nullity. The Pintsch Co., as recently reported, has entered into a price agreement with the other companies controlling the patent for drawing thin tungsten wire, capable of being easily wound on formers, and other companies have also given their adhesion to the scheme.

Economies Effected by Electricity in Industrial Heating.—In a doll factory at Chicago three 39-kw. electric drying ovens have been installed to drive moisture out of doll heads and bodies after they have been moulded from a plastic composition. This installation shortens the drying time from three or four days to one hour. The method previously used was air drying. It was impossible to use gas, owing to explosive vapours given off from the plastic composition. Steam heat was out of the question on account of its inability to give sufficient high temperatures. The installation of electric ovens eliminated the work of eight girls, who were paid $7 per week each. Electric heat also gave a much better product.

In a factory engaged in making paper roofing, an application of heat was necessary to join the ends of the paper passing through the process of manufacture. At first three tailors' irons were used for applying heat to the joint; with this process it was necessary to stop the machinery for five or six minutes. A home-made heating unit has replaced the irons. This consists of a large block of iron kept at a constant temperature by electric heat. Formerly, when the roofing machinery was stopped for the joining operation the parts remaining in the hot liquid, colouring liquid, or sand received a surplus of this material, thus materially reducing the quality of the roofing, which consequently had to be sold at a lower price. The installation of the iron block made it possible to complete operations without stopping the machinery. This contrivance, while it did not reduce labour charges, materially increased the production and also the quality of the goods. Three of these heaters are in use; two are rated at 18·5 kw. and one at 16 kw.

A third installation which is proving quite successful is a 236-kw. conveyor-type oven about 80 ft. (24 m.) long. It is used for japanning automobile parts, and supplanted gas equipment: it is showing a consumption of 9 kw.-hours per 100 lb. (45·35 kg.) of metal baked, and still better results are expected when the workmen become more proficient in handling it. When the change from gas to electric heat was made the number of workmen required was reduced by six.—A. F. Allsop, in the *Electrical World*.

Trade Openings.—The Department of Commercial Intelligence of the Board of Trade has received applications for the names of British manufacturers or producers of the following (amongst other) articles :—

Carbon electrodes.
Diamond dies for wire drawing.
Boilers designed for using peat as fuel.
Gas generators designed for peat.
Machinery for excavating and generally handling peat.

Saving Labour on Pole Holes.—In the June issue of the *Telephone Engineer*, Mr. J. B. Stoneking describes the use of explosives as a substitute for digging in various sorts of soil. His attention was first called to the practicability of the dynamite method of hole digging by an old miner on some telephone line construction in Montana, where the men were paid a certain sum per hole. The soil was a clay loam, slightly moist, but firm enough to require barring in digging the material. A bar was driven 30 in. into the ground to make a hole for the dynamite, from ¼ lb. to ½ lb. of which was used per hole, generally without tamping, but in some cases in more compact material a short plug of wet clay was used. A bridge of earth was left over the cavity formed by the explosion, but a few blows with a shovel caved this in, and the débris was removed from the bottom. A good hole from 10 to 14 in. in diameter and from 3 to 3½ ft. deep, when cleaned, was obtained, the sides and bottom being well compacted. The miner was enabled by this means to complete nearly twice as many holes per day as any other man in the digging crew.

Later trials in different soils have shown that what is a good loading practice for one condition does not always hold true for others, and it is necessary to shoot a few holes in order to arrive at a correct loading.

Better results have been obtained by removing the top earth to a depth of several inches and to the diameter of the pole hole desired before making the bore hole for the dynamite. This has the effect of relieving the pressure and diminishing the formation of the bridge over the cavity. In making the holes for the dynamite a punch bar driven by hammers, a soil auger with a long handle, or a churn drill is generally used, although a large telephone company uses a specially made hollow pipe which is churned up and down, doing very effective work in the soil, enough water being used to make a thin mud.

For deeper work, up to 6½ ft., very good drills are made by tying small pieces of from one-eighth to one-half cartridge to a small straight lath or stick, starting at the bottom end and spacing them about 6 to 12 in. apart, leaving the last piece about 18 to 24 in. below the top of the ground. This distributes the charge along the entire hole and packs the earth tightly against the sides, leaving a cavity from 12 to 18 in. in diameter. Sometimes the dynamite is inserted into a long roll or cylinder of heavy stiff paper, and held in place by sticking pins through it, or by cutting short sticks the length it is desired to space the cartridges. Care should always be taken not to allow earth to fall into and close the hole between the cartridges, for this has a tendency to break the detonating wave from one cartridge to another, and may result in misfires.

Ordinarily no tamping is necessary, but for harder material a small amount of tamping has the effect of confining the gases formed in the explosion and forcing them to do more work laterally. Tamping generally leaves a bridge over the cavity. By varying the size of the cartridges, the spacing apart along the hole, and the amount of tamping, in a few trial holes the engineer is able to obtain a system of loading to fit almost any conditions.

Due to the wide adaptability and elasticity of this method of digging holes, the quickness, absence of high first cost for equipment and overhead charges for maintenance, and low cost per hole, as compared to hand labour, it has met with much favour from engineers and contractors who have given it a thorough trial.

Appointments Vacant.—Shift engineer (63s.) for the Stalybridge, Hyde, Mossley and Dukinfield Tramways Board; draughtsman, engineering clerk of works (£285 + £15 bonus), assistant, engineering clerk of works (£5 per week), and an electrical engineer (£5 per week), for a large power station; invalid young officers wanted to act as switchboard attendants in an electricity generating station (25s. + 12s. war bonus); switchboard attendant for the Stepney B.C. Electricity Department. See our advertising pages to-day.

Institution and Lecture Notes.—Diesel Engine Users' Association.—The June meeting of the Association was held during the week in which the Incorporated Municipal Electrical Association was holding its meetings in London. This arrangement had been made for the convenience of engineers in the provinces, who in some cases are members of both Associations, and who, in consequence of being at a long distance from London, may not have frequent opportunities of attending to discuss Diesel engine matters. There was a large attendance, including a few visitors interested in the Association's work who had been invited by the Committee to attend on this occasion. The election of several new members and "subscribers" was announced.

The result of the lengthy negotiations with the Inland Revenue authorities in the matter of the allowance for depreciation of Diesel engines for income-tax assessment was reported. The new rate allowed for this purpose for Diesel engines is 10 per cent., and this increased allowance is to remain in force for three years after the cessation of the war, when either party is to be at liberty to claim a revision.

Considerable interest had been aroused by Mr. Geoffrey Porter's paper on "Tar Oil Fuel and Diesel Engines," which had been read at the previous meeting, and in the course of the discussion which took place at this following meeting a further amount of useful information on the subject was forthcoming. In response to requests received from several quarters, the president announced that reprints of the report by Dr. E. Graefe on "The Influence of Sulphur in Liquid Fuels in Internal-Combustion Engines," which had been circulated among the members in February, 1915, would again be sent out to members and "subscribers" of the Association.

Illuminating Engineering Society (U.S.A.).—The Council has decided that any Member or Associate Member of the Society in good standing when entering the military or naval service of the United States, or any of its Allies, may upon request before October 1st, 1917, or if called out after that date, have his name retained upon the Membership Roll of the Society without payment of dues, during the year ending September 30th, 1918. The Council has invested $1,000 in United States Liberty Bonds.

In lieu of the regular Annual Convention, which has been abandoned, the Society will hold a "Correspondence Convention," during which the papers prepared for this Annual Convention will be circulated, and written discussions on these papers may be submitted for publication. Any who are interested in such papers may receive a copy and submit discussions upon application to the General Offices of the Society, 29, West 39th Street, New York, N.Y.

Society of Engineers.—The balance-sheet for the year 1916 shows an excess of assets over liabilities of £753. The income was £673 and the expenditure £700, showing a deficit of £27.

Railway Employes' Wages, &c.—The Executive Committee of the Associated Society of Locomotive Engineers and Firemen was to meet the Railway Executive in London, on Tuesday, to discuss a programme of a universal eight hours' day for locomotive men; 14s. a day for drivers and electric motormen; 10s. a day for firemen; and 7s. a day for cleaners, with a sliding-scale arrangement to provide for any further increase in the cost of living.—*Times.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—Exeter T.C. has rejected a proposal, by the Electricity Committee, to increase the salary of the engineer, Mr. H. D. MUNRO, from £475 to £550 a year.

Southwark Council's Electric Light Committee reports that it has received a report from Mr. D. M. KINGHORN, the electrical engineer, to the effect that on the National Service Act coming into operation, followed by the appeal to municipal officials to enrol, he offered his services to the Government, with the result that he has now been offered the position of general manager of an assembly station by the Trench Warfare Supply Department. The position is of great national importance, and he asks for the necessary permission of the Council to accept it. The Committee gave the matter very careful consideration, and, having regard to the whole of the circumstances surrounding the application, feels that it is one which it would not be advisable in the interests of the Council generally to grant. It has accordingly refused to grant the permission.

Grays U.D.C. has granted a war bonus of £20 a year to Mr. E. D. LONG, electrical engineer.

Bury Corporation Electricity Committee has congratulated Mr. S. J. WATSON, the borough electrical engineer, upon his election as President of the Municipal Electrical Association for the ensuing year.

Ashton-under-Lyne T.C. has increased the salary of Mr. W. A. WALES, chief assistant engineer in the electricity department of the Corporation, by £50 per annum. All officials of the Corporation in receipt of salaries under £300 a year are to have an increase or war bonus of 10 per cent.

Mr. C. H. MANNING desires to relinquish the duties of traffic superintendent under Preston Tramways Committee.

The salary of Mr. A. ASPINALL, electrical engineer to the Brighouse Corporation, is to be increased from £160 to £169 per annum, as from April 1st.

General.—Mr. W. T. TARLETON, a member of the British Westinghouse staff in Johannesburg, and eldest son of Mr. W. I. Tarleton, mains superintendent of the Corporation electrical department at Cape Town, has joined the South African Field Artillery.

Mr. H. P. GIBBS, general manager of the Tata Hydro-electric Scheme in Bombay, has left for America on seven months' leave, and has given up the position of consulting electrical engineer to the Mysore Government. Mr. S. G. FORBES, chief electrical engineer in Mysore, having returned from leave, has taken over charge from Mr. S. D. SESHADRI IYENGAR, the chief operator from Sivasamudram.—*Indian Engineering.*

Mr. A. A. CAMPBELL SWINTON, F.R.S., has been elected chairman of the Council of the Royal Society of Arts.

According to the *Morning Post*, Mr. ROBERT MOLESWORTH KINDERSLEY has joined the board of the Eastern Telegraph Co., Ltd.

It is stated in the Press that previous to the changes in the Government, Dr. Addison had invited Sir Thomas Munro, County Clerk of Lanarkshire, to accept the position of Chief Director in the Labour Regulation Department of the Ministry of Munitions, in order to supervise the work in connection with general labour matters affecting wages and disputes, and, in particular, the formation, as soon as possible, of representative commitees of employers and workpeople.

Roll of Honour.—Captain JAMES ANDERSON, K.O.Y.L.I., aged 28 years, who has died of wounds, was an electrical engineer.

Sergeant D. LAWRIE, who was an electrical engineer in Glasgow, is now officially presumed to have been killed in action. He had previously been posted as missing.

Private A. FRASER, Highland Light Infantry, who was formerly a conductor on the Glasgow Corporation tramways, has been awarded the Military Medal.

First-Class Wireman F. J. MARSHALL, lost by the blowing up of H.M.S. *Vanguard*, was, before joining the service, with Mr. J. Richards, electrical engineer, of Burton-on-Trent.

Lieutenant O. J. T. RUNGE, Machine Gun Corps, reported killed on October 15th, was formerly with Messrs. Fraser and Chalmers, of Erith. He came home from Montreal to enlist on the outbreak of war. He was awarded the Military Cross in June, 1916.

Private R. A. TAY, Royal Warwickshires, aged 22, who has been killed in action, was an electrician at the Jubilee Pits, Sandwell.

Corporal A. FEATHERSTONE, Manchester Regiment, awarded the Military Medal, was an employé of Messrs C. Macintosh and Co., Ltd., electric wire and cable manufacturers, Manchester.

Private C. HAMPSON, Manchester Regiment, killed in action, was also employed by Messrs. C. Macintosh & Co., Ltd.

Fitter F. H. DAVIES, R.G.A., killed in action on July 5th, was employed at the Hulme Electric Works, Manchester.

Lieutenant H. BUTLER, R.F.C., killed, was on the staff of Messrs. Dick, Kerr & Co., Ltd., of Preston.

Obituary.—MR. A. MOSELY.—We regret to record the death of Mr. Alfred Mosely, C.M.G., which occurred on Sunday, at the age of 62 years. It will be remembered that he organised an Industrial Commission to the U.S.A. in 1902, and an Educational Commission in 1903.

SIR C. S. MILBURN.—The late Sir Charles Stamp Milburn was a director of the Newcastle & District Electric Lighting Co., Ltd.

MR. R. ROWLAND.—The death took place on July 7th of Mr. Richard Rowland, mains superintendent at the Peterborough Corporation electricity works. He was 37 years of age, and was brother of the acting engineer of the works, Mr. T. Rowland.

NEW COMPANIES REGISTERED.

Korting Bros. (1917), Ltd. (148,041).—Private company. Registered July 21st. Capital, £15,000 in £1 shares. Founders, electrical, mechanical, gas, heating, and ventilating engineers, &c. The subscribers (each with one share) are: F. G. Kerly, 10-11, Austin Friars, E.C., solicitor; H. Glenister, 28, Egerton Gardens, Hendon, N.W., solicitor's clerk. The first directors are: F. A. Robinson, E. H. Beckett, and O. Lindermann. Registered office: 53, Victoria Street, W.

Alfred Herbert (Russia), Ltd. (147,920).—Private company. Registered July 16th. Capital, £25,000 in £1 shares. To carry on in Russia, or elsewhere in Europe, Asia, the United Kingdom, the United States, and Canada the business of buying, selling, manufacturing, repairing, and letting on hire machinery, machine tools, plant, motor cars and cycles, electrical, hydraulic, and mechanical engineers, &c. The subscribers (each with one share) are A. Herbert, Dunley Manor, Whitchurch, Hants, chairman of Alfred Herbert, Ltd., Coventry; H. C. Chambers, Hern, Blakesley Road, Yardley, Birmingham, solicitor's managing clerk. Permanent governing director: A. Herbert. Solicitors: Pinsent & Co., 6, Bennett's Hill, Birmingham.

National Union of Manufacturers, Incorporated (147,967).—Registered July 13th by Moreton, Phillips & Son, 11-12, Finsbury Square, E.C., as a company limited by guarantee, not formed for purpose of profit. The word "Limited" is omitted from the title by licence of the Board of Trade. The number of members is unlimited, and each member is liable for five guineas in the event of winding up. Objects: To undertake all or any of the liabilities and assets of an unincorporated association known as the British Manufacturers' Association, 1915, whose principal office is at 11, Paternoster Square, E.C., to promote the home, colonial, and foreign trades and industries of the United Kingdom, to encourage free intercourse between masters and workmen, to render pecuniary, legal, and other assistance to small essential industries in case of need (provided that no such assistance shall be given to members of the Association, and that the laws relating to champerty and maintenance shall be observed), to collect and disseminate statistical and other information, &c. The management is vested in an executive council. President, G. Terrell, M.P. (Tyler & Co., Ltd.); deputy-chairman, R. L. Mathews (W. J. Turney & Co., Ltd.); treasurer, J. Walker (John Walker & Co., Ltd.). Solicitors: Moreton, Phillips & Son, 11-12, Finsbury Square, E.C. Secretary: G. W. Cheesman. Registered office: 11, Paternoster Square, E.C.

British Ignition Apparatus Association, Ltd. (148,001).—Private company. Registered July 16th by A. R. Monks, 123, Cannon Street, E.C., as a company limited by guarantee, with not more than 50 members, each liable for £1 in the event of winding up. Objects: To promote and protect the interests of manufacturers of ignition apparatus in the United Kingdom, to conduct and assist in experiments, to promote the standardisation of quality and form of ignition apparatus, and the adoption of equitable forms of contracts, &c. The subscribers (each with one share) are: P. F. Bennett, Ardencote, Four Oaks, manufacturer; R. B. North, St. Wilfred's, Magden Lane, Walford, manufacturer; G. A. Lister, Coundon Road, Coventry, engineer; W. A. Anderson, 94, West Road, Westcliff-on-Sea, company secretary; G. H. Woods, 2, Norfolk Street, W.C., engineer; E. Garton, Tralee, Kenilworth, engineer; M. C. Dask, 83, Cannon Street, E.C., manufacturer. The first members of the governing committee are to be appointed at the first general meeting. Registered office: 29-34, Mansion House Chambers, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Tyne Electric Steel Foundries.—Issue on June 19th, 1917, of £200, and on June 25th of £100 debentures, part of a series of which particulars have already been filed.

South Metropolitan Electric Light & Power Co., Ltd.—Second debenture dated July 18th, 1917, to secure £50,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Minister of Munitions.

CITY NOTES.

British Thomson-Houston Co., Ltd.

In their report for 1916, the directors refer to the completion of the canteen and works extension at Willesden, and to the fact that a canteen is approaching completion at the Rugby works. Owing to further dilution of labour and the absence of employés who were familiar with the stocks, it was not possible to take an inventory at the Willesden factory and at the Rugby main factory, so that book figures had been relied upon. The usual complete inventory was taken at the other factories and branch offices. As stated last week, the profits, after deducting all expenses and charges other than debenture and loan interest, were £359,364. plus £73,359 brought forward. £50,000 is required for excess profit duty and munitions levy and for increased depreciation to the end of 1915. The reserve *re* raw materials made at December, 1915, has not been required, and has been written back. Interest on debentures and loans for 1916 has absorbed £70,100, and there is to be appropriated for depreciation £153,700 (depreciation of goodwill, patents, and licences £40,636; depreciation of plant, £103,715; depreciation of shares and debentures, £4,589; and depreciation of apparatus, supplies, and meters, &c., £4,759). £163,923 is being carried forward subject to the deduction of munitions levy for 1916, the amount of which has not yet been ascertained. [For 1915 the profit was £262,361, interest was £57,922, and depreciation appropriations were £144,878.] The total par value of debentures returned to date is £38,505, and the net amount outstanding to date is £173,495. The usual practice has been followed in making reserves to cover risks in connection with bad debts and other contingencies. The report refers to the death of Sir George Franklin (a director for 18 years), and to the resignation of Mr. J. F. Nauheim (a director for 20 years), and Mr. E. Thurnauer, who for 21 years had represented the French shareholders, does not now stand for re-election. Mr. H. C. Levis, the managing director, has been appointed chairman. 152 employés have fallen in the war, 138 have been wounded, 102 have received commissions, 27 have won special honours, 9 have been mentioned in dispatches, and 11 have been specially commended for service in the field. A permanent memorial tablet, containing the names of all who have died in active service, will be erected at the end of the war.

Clevedon, Portishead & District Electric Supply Co., Ltd.—At the annual meeting, the directors reported a satisfactory growth of the undertaking, in spite of the very difficult conditions prevailing, the gross revenue being more than double that of the previous year. The number of consumers connected in Portishead has been increased from 179 to 193, and the sub-station at Bower Ashton is supplying power to the South Liberty Colliery and the Ashton Vale Brick Works. The extension of mains through Long Ashton village is almost completed, and a number of consumers have been connected. The total receipts on revenue account amounted to £3,965, compared with £1,737 last year. Notwithstanding the increased cost of fuel and all other expenses, the gross profit is £224, compared with £696 last year.

North Melbourne Electric Tramways & Lighting Co., Ltd.—The gross receipts show an increase from £33,462 to £40,358. The expenses—principally due to increased wages and high cost of materials and freight, factors which, unfortunately, show no sign of disappearing—increased from £21,730 to £28,888, the net revenue therefore being £11,470, as compared with £11,732 for the previous year. Capital expenditure amounted to £1,917. A contract has been entered into with the Melbourne City Council for the lighting of Flemington and Kensington. The necessary work of laying the mains and erecting the standards is being proceeded with as rapidly as possible.—*Financier.*

Eastern Extension, Australasia & China Telegraph Co., Ltd.—Owing to delays arising from the war in obtaining the necessary returns from foreign stations and administrations it will be impossible to present the accounts and balance sheet, duly audited, for the year 1916 to the shareholders until the autumn. As, however, it is necessary, under the provisions of the Companies' (Consolidation) Act, 1908, to hold a general meeting within 15 months from the date of the last preceding meeting, the directors convened an extraordinary general meeting, which was held on 17th inst., Sir J. Wolfe Barry presiding. The proceedings were purely formal.

Greenwood & Batley, Ltd.—The report for the period from July 12th, 1915, to March 31st last states that, after providing for interest on debentures, expenses of management, doubtful debts, the writing down of war capital expenditure, and the company's anticipated liability under the Finance Acts, there is a profit of £119,242. The directors have appropriated £45,000 for depreciation and £13,000 to reserve account, and recommend that a final dividend on the ordinary shares of 15 per cent. (that is, 30s. per fully-paid share and 15s. per £5 paid share).

Crompton & Co., Ltd.—The issue of the accounts for the year ended March, 1917, has been postponed pending the settlement with the Ministry of Munitions of various matters connected with the "control" of the business. The profits for the year justify the dividend of 5 per cent. per annum on the ordinary (and 7 per cent. on the preference) shares. The works continue to be fully employed on orders of national importance. Meeting: August 1st.

South Brazilian Railways Co., Ltd.—In their report, the directors show that there was a loss on the Curityba tramways undertaking of £2,856, and a net profit of £12,472 on the electric light and power undertaking, leaving the net earnings £9,616. Of this £5,218 has been paid to the unsecured creditors, £773 has been put to accident damages account, and interest on debentures is to be paid at 2s. 11d. per £20 debenture for the year 1915-16.

France.—La Société Hydro-Electrique et Metallurgique du Palais is the name of a new company which has recently been formed in Paris, with a capital of £200,000, to establish new electrometallurgical works. The Société d'Electro-Metallurgie de Dives is interested in the new undertaking.

General Electric Co., U.S.A.—The "Times" New York correspondent states that this company has just issued $15,000,000 of three-year 6 per cent. notes, which have been offered to the public at 99½.

Liverpool Overhead Railway Co.—Interim dividend for June half-year at the rate of 5 per cent. on the preference and 2½ per cent. per annum on the ordinary, less income-tax 5s. in the £.

South American Light & Power Co., Ltd.—After paying 5 per cent., less income-tax, for 1916, £2,000 is written off discount on debentures, and £3,696 is to be carried forward.

Kaministiquia Power Co.—Quarterly dividend, $1¾ per share (seven per cent. per annum).

Anglo-American Telegraph Co., Ltd. — Interim dividend for the quarter, 15s. per cent. on the ordinary stock, and £1 10s. per cent. on the preferred stock, less income-tax.

Bournemouth & Poole Electricity Supply Co., Ltd.—Interim dividend on the ordinary shares at the rate of 5 per cent. per annum, less tax, for the half-year ended June 30th.

Electrical Utilities, Ltd.—A dividend of 1¼ per cent. on the preferred stock is announced.

City of Buenos Aires Tramways Co. (1904), Ltd.—Dividend of 1s. 3d. per share, less income-tax, for three months ended June.

London Electric Railway Dividends.—*Central London Railway Co.*—Interim dividends for the six months ended June 30th on the undivided ordinary stock of 1½ per cent., and on the preferred ordinary stock of 2 per cent.

London Electric Railway Co.—Dividend for the half-year at the rate of 2 per cent. on the four per cent. preference stock and ¾ per cent. on the ordinary shares.

City & South London Railway Co.—Dividends of 2½ per cent. on the five per cent. preference stocks, 1891, 1896, 1901, and 1903, and ¾ per cent. on the ordinary stock for the six months.

Metropolitan District Railway Co.—Interim dividends for the six months ended June 30th on the four per cent. guaranteed stock of 2 per cent., on the first preference stock of 2½ per cent., and on the second preference stock of 1½ per cent.

Underground Electric Railways Co. of London, Ltd.—Interest on the six per cent. first cumulative income debenture stock, less tax, at 3 per cent., and coupon No. 19 off the six per cent. income bonds, free of tax, at 2 per cent.

Trowbridge Electric Supply Co., Ltd.—The result of working for 1916 is a profit of £546. Dividend, 7½ per cent. on ordinary shares, 5 per cent. on preference. To depreciation £225, to reserve £75, carried forward £56. The output of electricity has increased considerably, due in part to new consumers for lighting, but mainly to heavy day loads for power purposes, in addition to an all-night supply.

Spain.—A new company has recently been organised in Madrid with a capital of no less than £1,000,000, and the title La Sociedad Espanola de Construcciones Electro-Mecanica, to establish works near Cordoba for the electrolytic manufacture of copper and also electrical material. The Schneider Co., of Le Creusot, France, and a number of the leading Spanish iron and steel companies are interested in the new undertaking.

STOCKS AND SHARES.

TUESDAY EVENING.

STOCK Exchange markets are overshadowed by the news from Russia. That this should cause a certain amount of depression is only natural, but the depression is noticeable more in the way of a check administered to business than in any violent fall in prices. The Russian disappointment is neutralised to some extent by the comforting reflection that every day brings the United States nearer to the firing line with a substantial new army, and this suffices to hold prices reasonably steady. Rumours of a new War Loan continue to be very persistent, and the latest vote of credit taken by the Government has pointed the prophecy of those who anticipate a new issue in the forthcoming autumn. At the same time, many good authorities hold the view that another War Loan is unlikely to appear for some time yet.

The principal feature in the domestic markets is the declaration of Home Railway interim dividends. Of these, the announcement of the Underground Electric Railways Co. occasioned surprise and disappointment, because the market had been looking for 5 per cent., whereas the company declares 4 per cent., the same rate as that of six months ago, but comparing with 6 per cent. this time last year. The dividend on the bonds for the time being, therefore, becomes 4 per cent., and at 80 the return is exactly 5 per cent. on the money, which is equivalent to 6¼ per cent., less tax. The price of the bonds has fallen 4 points to 80, and the £10 shares are ¼ down at 1¼.

The London Electric and the City & South London Companies are paying ¾ per cent. on their ordinary stocks, while the District is to distribute 1½ per cent. on the 2nd preference. All three are the same as those of a year ago. The Metropolitan dividend comes out on Thursday in this week. The market as a whole is inclined to be reactionary, following the course of Consols, which have given way from the highest point touched last week. Metropolitan fell ½; Districts followed suit. But Central London Assented ordinary has gained a point.

The telegraph and cable market is uniformly good. Further advances have been obtained by the higher-priced stocks and shares, and notwithstanding the dulness of investment securities generally, in this particular section there is certainly no set-back. The telegraph market is one of those in which current quotations stand as a rule higher than the levels current on the outbreak of war. For instance, Eastern Telegraphs at 141½ and Eastern Extensions at 14½ show rises for the three years of 11½ and 1½ respectively. Globe Ordinary at 12⅞ are 27s. 6d. up, although the preference at 10½ show a fall of 2½. fixed interest shares having, of course, suffered in sympathy with Consols, the price of which has come down from 72½. at which it stood on the outbreak of war, to 55½ to-day. Anglo-American preferred at 99 is 9½ down over the three years, another instance of the way in which the price of fixed-interest stocks have fallen, while Westerns at 14½ are £1 up, and Panamas at 31s. 3d. show a rise of 6s. 3d. The principal improvement in this market, comparatively speaking, is that secured by Marconis, the ordinary shares having risen from 1½ on July 27th, 1914, to 3½ now, an advance of 25s., and the preference at 2⅛ are 1 1/16 up. Canadian Marconi at 10s. 9d. have practically doubled within the period, while the Americans at 17s. 6d. are 7s. to the good.

Underground Income Bonds at 80 show a fall of 7½ since July, 1914. Metropolitan Consolidated at 23½ is 13½ down, while Districts at 16 are 6 points lower. Central London deferred, now standing 60, compares with 81 on the outbreak of war.

Once again it is the London section in the electricity supply market that stands out with prominent strength on the week. City Ordinary at 12⅞ are 5s. up. County Ordinary are 10s. higher at 11¼. South Metropolitan preference have jumped up 1s. 6d., and the ordinary are very firm at a guinea. St. James's rose 5s. on the dividend, and the remainder of the list keeps hard. Edison Swan partly paid changed hands at 15s. the other day. British Aluminium are a noteworthy feature of strength at 30s. Edmundson's non-cumulative preference are wanted at about 11s. 3d.

Callenders continue to advance, a rise of 10s. taking the price to 14½. In the iron and steel group, Babcock & Wilcox are better at £3.

The Gas Light & Coke Co. has reduced its dividend, and the stock has eased off to 71.

Brazilian varieties are duller on a sharp drop in exchange, and Brazil Tractions shed ½ to 49½, the preferred falling a point to 90. Mexico Tramways bonds are a trifle easier, and British Columbia preference has lost 3 points. Argentines are mostly better, and the Tramways First preference sympathised with 1/16 advance. Canadian General Electric is 3 lower at 117½. Industrials as a whole are the least affected by the Russian news, and rubber shares steadily appreciate with the price of the produce, which has improved to 2s. 8d. per lb.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price July 24, 1917.	Rise or fall this week.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	10	9	6¼	—	£3 18 6
Charing Cross Ordinary	5	5	8½	—	7 2 10
do. do. do. 4½ Pref.	4½	4½	8½	—	6 18 6
Chelsea	4	3	2½	—	5 4 4
City of London	8	8	13⅞	+ ½	6 5 6
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	11¼	+ ¼	6 1 9
do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	10	5½	—	5 11 7
London Electric	3	3	1	—	Nil
do. do. 6 per cent. Pref.	6	4	8⅝	—	5 6 8
Metropolitan	3	3	2½	—	6 0 0
do. 4½ per cent. Pref.	4½	4½	8½	—	7 4 9
St. James' and Pall Mall	3	3	6⅞	+ ½	5 18 6
South London	5	5	9⅜	—	7 5 6
South Metropolitan Pref.	7	7	21/6	+1/3	6 10 2
Westminster Ordinary	7	7	8½	—	6 1 9
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	99	—	6 1 0
do. Def.	33/6	1½	22½	—	6 16 4
Chile Telephone	8	8	7	—	5 14 4
Cuba Sub. Ord.	5	5	8½	—	5 17 8
Eastern Extension	8	8	14½	+ ½	*5 12 8
Eastern Tel. Ord.	8	8	141¼	+1¼	*5 13 1
Globe Tel. and T. Ord.	7	7	12⅞	—	*5 9 10
do. Pref.	6	6	10½	—	5 17 1
Great Northern Tel.	22	24	86	—	6 18 4
Indo-European	13	13	51½	+ ½	6 6 3
Marconi	10	10	3½	— ⅛	8 8 6
New York Tel. 4½	4½	4½	99	—	4 11 0
Oriental Telephone Ord.	10	10	9⅜	—	3 12 9
United R. Plate Tel.	8	8	6⅞	—	*5 18 6
West India and Pan.	6d.	6d.	1/3	— 1/6	1 12 0
Western Telegraph	8	8	14½	+ ½	*5 10 4
HOME RAILS.					
Central London, Ord. Assented	4	4	61½	+1	6 10 1
Metropolitan	1	1	23½	— ½	4 6 1
do. District	Nil	Nil	15½	— ½	Nil
Underground Electric Ordinary	Nil	Nil	1⅜	— ⅛	Nil
do. do. "A"	Nil	Nil	5/8	—	Nil
do. do. Income	6	4	80	—4	*5 0 0
FOREIGN TRAMS, &c.					
	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams, First Pref.	6½	6½	9⅜	+ 1/6	9 11 4
do. 2nd Pref.	6½	—	2⅜	—	—
do. 5 Deb.	5	5	66	—	7 6 6
Brazil Tractions	4	4	49½	— ½	—
Bombay Electric Pref.	6	6	10	—	6 0 0
British Columbia Elec. Ry. Pfce.	5	5	53½	—3	9 10 6
do. do. Preferred	Nil	Nil	89½	—	Nil
do. do. Deferred	Nil	Nil	27½	—	Nil
do. do. Deb.	4½	4½	67½	—2	7 7 10
Mexico Trams 5 per cent. Bonds	Nil	Nil	36	—1	Nil
do. 6 per cent. Bonds	Nil	Nil	80	—	Nil
Mexican Light Common	Nil	Nil	14½	—	Nil
do. Pref.	Nil	Nil	23½	—	Nil
do. 1st Bonds	Nil	Nil	69½	—	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	3	+ ⅛	5 0 0
British Aluminium Ord.	7	10	30/	+1/	6 13 4
British Insulated Ord.	17½	20	15⅜	—	7 15 0
British Westinghouse Pref.	7½	7½	3-16	—	5 17 2
Callenders	20	20	14½	+ ½	7 0 6
do. 5 Pref.	5	5	4½	—	5 17 8
Castner-Kellner	23	23	8-16	—	6 19 2
Edison Swan, fully paid	—	—	1½	—	Nil
do. do. 4 per cent. Deb.	4	4	70½	—	5 13 6
Electric Construction	7½	7½	7⅜	—	8 0 0
Gen. Elec. Pref.	5	5	10	—	6 0 0
do. Ord.	18	10	18½	—	6 1 5
Henley	25	25	16	—	7 16 3
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	13½	—	*3 5 0
Telegraph Con.	20	20	32½	—	*6 3 9

*Dividends paid free of income-tax.

MANUFACTURE OF SYNTHETIC NITRATES BY ELECTRIC POWER.

At the meeting of the Society of Chemical Industry last week, Mr. E. Kilburn Scott read a paper on this subject. He said that when fixing atmospheric nitrogen in an electric furnace, the reaction mainly depended on the contact of air with the arc; many furnaces were faulty in this respect, and it was found that their defects were due to their being of the single-phase type; after showing that the Birkeland-Eyde, Schönherr, and Pauling furnaces were subject to this criticism, he described a three-phase furnace of his own design in which, he claimed, every particle of air must come into contact with the rapidly revolving sheet of flame. This was the only nitrogen furnace that had been developed as a self-contained three-phase unit.*

It was essential that the arcs should be blown into flames, either by a stationary magnetic field, as in the Birkeland-Eyde type, or a rotating magnetic field, as in the Moscicaki furnace, or by the air flowing through the furnace, as in the Schönherr, Pauling, and Kilburn Scott types. It was a disadvantage to employ a magnetic field, as this involved the provision of a supply of direct current, whereas the air must pass through the furnace, and the arc flames produced by air flow were just as effective as those obtained by a magnetic field.

An advantage of the three-phase furnace was that it required only three electrodes, whereas three single-phase furnaces required six.

In single-phase furnaces the arc was started by bringing the electrodes together until the air gap was sufficiently short to allow the high-pressure current to jump across, a process involving risk to the plant; in his three-phase furnace the author avoided this drawback by using pilot sparks. A wire placed half-way between the tips of the electrodes was connected to a high-frequency apparatus, and when this was set in operation sparks passed from the wire to the electrodes, thus breaking down the air dielectric and allowing the arc to strike. The electrodes could, therefore, be set at the best distance apart, and a lower pressure could be used to operate the furnace, with a better power factor. He found it beneficial to keep the pilot sparks on all the time, as the yield was improved and continuity of working obtained, thus avoiding surges and other troublesome electrical phenomena. The flow of energy in a three-phase furnace was practically always at a maximum, and the arcs assisted in maintaining each other, whereas in a single-phase furnace the power varied from zero to a maximum twice in each cycle. Preheating the air economised heat, raised the temperature of the furnace, and dried the air, resulting in a larger yield. The higher the temperature the better, as it helped ionisation of the air; he had found it advantageous to use 250 deg. C. The preheat could be obtained from the gases leaving the furnace, and one large preheater could serve several furnaces.

The chemical action being reversible, it was important to chill the nitric oxide gas quickly. With single-phase furnaces, excess air was blown through for this purpose; in the Kilburn Scott type, a boiler was used to form the roof.

This method of cooling was effective owing to the latent heat of steam, and the steam could be used for generating electric power, or providing distilled water for the absorption plant. The boiler was connected to earth, and the blown arc flame acted on it in much the same way as any ordinary flame burning to carbon dioxide. The metal was not affected, because nitric oxide did not attack it. In Norway the furnace gases were passed through an ordinary Babcock-Wilcox boiler when the temperature had been lowered to about 200 deg. C., at which temperature nitrogen peroxide could do damage, and it was much safer in this respect to use the boiler directly on the furnace where the gas was still in the nitric oxide stage.

The yield obtained from single-phase furnaces was generally estimated at 50 to 60 gm. (1¾ to 2 oz.) of pure nitric acid per kw.-hour, or, say, half a ton of pure acid per kw.-year. With the author's three-phase furnace yields 50 per cent. greater were quite feasible. Of the total energy put into the furnace, about 10 per cent. could be obtained as low-pressure steam. The yield rose to its full value in about a quarter of an hour from the time of starting the furnace. The pressure required to operate the furnace was under 1,500 volts, and power factors over 0.85 were obtained.

The usual absorption system consisted of a range of high towers of acid-proof brickwork, filled with quartz pebbles or some patented form of acid-proof filling. The gas entered each tower at the bottom and rose through the filling, whilst the absorbing liquid ran down over the filling in thin layers. Dilute nitric acid was collected at the bottom of each tower and forced up to the top of the next one, the liquor passing from tower to tower in one direction while the gas passed in the opposite direction; the acid concentration attained was about 25 per cent., which was high enough to make ammonium and calcium nitrate. Nitrous acid was formed during the absorption process, and split up in the presence of water vapour into nitric oxide and peroxide, the former then taking up more oxygen from the excess air present; for this reason the gas should move slowly between the towers as well as inside them. Prof. Moscicaki found that by making the supply of liquor to the towers intermittent the absorption could be very much improved. His absorption chambers were rectangular in plan, built together in one block, with perforated party walls; the chambers were alternately filled with quartz pebbles and empty, and the gas passed at about 4 cm. per second (1½ in./sec.) horizontally through the block, while the absorbing liquor intermittently ran down the acid-proof filling. With the Moscicaki method 97 per cent. of the nitrogen peroxide gas was absorbed, and the nitric acid could be drawn off at a concentration of 40 to 50 per cent.

In the second part of his paper Mr. Scott compared in detail the direct method of making nitric acid with the indirect method (by the manufacture of calcium carbide and calcium cyanamide, and the oxidation of ammonia). He pointed out the many processes required for the latter system, the variety of machinery employed, and the necessity of facilities to supply limestone, coke, or anthracite, and carbon electrodes. On the other hand, the process of direct fixation of nitrogen was simple, the apparatus required a minimum, and the raw materials (air and water) universally available, so that the plant could be situated anywhere where suitable electrical energy was to be had. As regarded the cost of plant, the indirect process was not in the running with the direct, and the latter had a great advantage in respect of raw materials and labour, which would increase in the future.

Before the war electrical energy had been sold in this country at lower rates than at Niagara; in the future cheap power would be provided by large power stations, and some of 120,000 kw. each were already projected. Up-to-date coke ovens, with by-product recovery plant, would provide gas for power generation, and electricity would be largely used for electrochemical and metallurgical processes, one of the chief of which would be the manufacture of nitrates from air by the direct method. This lent itself particularly well to off-peak or off-season loads, as the furnaces could be switched on and off without detriment to themselves or to their products. The process could be established anywhere. In the case of coke-oven plant, the nitric acid could be combined with the ammonia derived from the gases to produce nitrate of ammonia, which was superior to sulphate of ammonia. The sale of such products depended on prices and analysis, and needed no goodwill or advertising; a new concern could sell all its output at once if it could supply a little below market price.

Discussion.

Mr. Bower said he was very much impressed by the discussion in the paper of the absorption process of Moscicaki. This seemed a very good method, because in the absorption of these gases it was necessary to carry out a double function, viz., to oxidise and to absorb, and the Moscicaki process seemed to take all the factors into account.

The President (Dr. Charles Carpenter) said this matter had not altogether been neglected by the authorities, and a good deal of work was being done at the present time. The outstanding difficulty when entering on the erection of plants of this magnitude was to decide which process to adopt, viz., the one requiring the minimum amount of power or the process described by Mr. Scott, in which it was suggested that the power requirements were considerably larger, yet the other advantages were such that it might be found in the long run to be the best process to adopt.

Dr. E. Fyleman asked whether there was any possibility of electrolytic corrosion in the boiler. He understood that it was almost impossible under practical conditions completely to convert the nitric oxide obtained in this process into nitric and nitrous acids, and that a certain small percentage, which was given as from 3 to 5 per cent., of the total nitrogen which was combined to form the nitric oxide escaped into the atmosphere. If that were so, those wishing to work the process were not absolutely unrestricted as to the spot upon which a plant could be put down. The question of cost was important, and Mr. Scott had given absolutely no basis to go upon in attempting to compare this system with others. Could he give some approximate figures as to the cost of a plant for producing a certain quantity of nitric acid, and the amount of power, labour, and supervision required?

Mr. F. Sproxton could not see why the yield of the new furnace was only 50 per cent. better than that of the old furnace. It appeared that the advantage should have been much greater. Was there any advantage in modifying the composition of the air by the admixture of oxygen to get nearer to the theoretical composition, say, four volumes of nitrogen to one of oxygen? Theoretically, there would be two volumes of nitrogen to one of oxygen.

Mr. J. B. Webb said the Moscicaki absorption process had been attracting a great deal of attention, and, as the author had pointed out, the important factor in the whole process was the oxidation of NO to NO_2. That seemed to depend on the actual time of traverse of the NO through the absorption towers, and in previous years the absorption was spoilt to a very large extent by the use of very fine packing, such as broken quartz. The packing in the towers must be of such a nature as to give both surface and free space, and he was at a loss to see how Prof. Moscicaki's patent packing helped

*The Kilburn Scott furnace, in its original form, was described in the Electrical Review of February 5th, 1915.

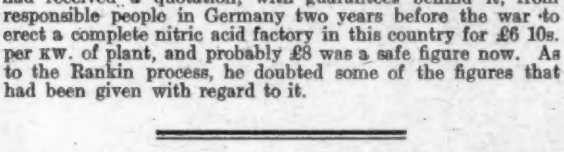
matters. Broken quartz packing gave approximately 40 per cent. free space, but he did not know why there need be two chambers. Why not have one chamber and pack it with, say, ring packing, which gave approximately 75 to 80 per cent. free space and, at the same time, a considerably greater surface than was obtained with broken quartz, unless the broken quartz was of the order of ¼ in. or less, in which case he would imagine the draught difficulties would be considerable?

Mr. E. W. MASON called attention to the fact that there was an American process, known as the Rankin process, which had been commented upon favourably by Prof. Norton. It consisted of a cylinder and piston with two small electrodes on it. The air was compressed and the arc started; then the arc was cut off and the gas allowed to expand, and it was claimed that good results were obtained.

Mr. SCOTT, in his reply, said that the fact that Mr. Bower appreciated the absorption system carried a great deal of weight with him, as Mr. Bower had made a considerable number of experiments. The President had mentioned that the Government were doing something at last, but it was three years late. The other day Dr. Addison had mentioned that something was going to be done with the fixation of atmospheric nitrogen. He had not thought of electrolytic corrosion in the boiler. He very carefully earthed the boiler, and alternating current did not give the same electrolytic corrosion as direct current. Nevertheless, it was known that corrosion with alternating current did take place under certain conditions, but he did not think there was much danger in this case. There was some escape into the air with the system used abroad, but he had it in his mind to make a complete cycle by taking the air and, after using it, adding oxygen to it, and not allowing it to go out into the air again. If oxygen were added to the air and then it were allowed to go out into the atmosphere again, it would be necessary to add so much that it would become too expensive. By working through a complete cycle it would only need make-up oxygen. He did not believe a great deal in patent packings. The Norwegians had pinned their faith to quartz. It was impossible, in all these fillings, to get rid of lime, and there was action on the lime; it was for this reason that quartz was better. The cost of a complete plant was, roughly, about £8 per KW. He had received a quotation, with guarantees behind it, from responsible people in Germany two years before the war to erect a complete nitric acid factory in this country for £6 10s. per KW. of plant, and probably £8 was a safe figure now. As to the Rankin process, he doubted some of the figures that had been given with regard to it.

THE MARCILLAC HAIL NET.

IT is a curious fact that so many contradictory results have been reported by well-qualified investigators in the field of electroculture and in the electrical protection of districts against hail and lightning. However, evidence is now accumulating to show that electroculture is thoroughly practical and successful when applied in a suitable manner, and probably the same is true of lightning conductors as a protection against hail. We described recently* the use of "barrages" of "electric niagaras" in this connection, and it will be seen that M. P. Marcillac's apparatus and system, as described below, are a good deal simpler and less costly. A considerable amount of evidence is available to show that the present installation, near the summit of Chenavari, gives definite protection against injurious hailstorms, and, in any case, the



THE ELECTRIC NET AT CHENAVARI.

cost of the equipment is so moderate that it is worth testing carefully in other instances.

The "electric net" (*épervier électrique*) illustrated in the accompanying figure, was erected four years ago at Rochemaure on the extinct volcano Chenavari (at the end of the Coiron volcanic chain), at an altitude of 1,660 ft. (506 m.). The equipment consists of nine wooden poles fitted with metallic aigrettes connected between themselves by conductors. Eight of these poles are set on a terrace about 980 ft. (300 m.) long, 650 ft. (200 m.) wide, and 40 ft. (12 m.) high on the summit of the volcano, so as to mark out the apices and centre of a polygon inscribed in a circle of about 295 ft. (90 m.) diameter and 1¼ acres (0.6 ha.) in area. The ninth post is set below the terrace, as shown.

The aigrettes are built up from broad strips of iron terminating in points. The conductors connecting them consist of twisted cords of reinforced barbed wire; their length amounts to about 1,970 ft. (600 m.), and the number of points to about 12,000. Ribbons of iron are bolted and soldered to the base of each aigrette, and are carried down the poles and into buried "gutters" of perforated iron filled with moistened coke. The free end of each strip is fitted with a branching distributor (*perd-fluide*). In addition, strips provided with hooks ensure intimate contact between earth-ribbon, coke, iron gutter, and soil, the latter being reached through the perforations in the gutter. Ten earth connections of this type are established, and a supplementary connection is made to a small stream below the terrace.

It should be noted that *no copper conductors* are used in the Marcillac equipment, which thus differs materially from Beauchamp's "electric niagaras" (*loc. cit.*), these using very substantial conductors of high conductivity electrolytic copper. The distinction is an important one, both as regards capital cost and the risk of theft where a number of equipments are erected to protect an extensive area. There is no reason to suppose that the higher resistance of the Marcillac conductors entails any loss of protective value. On the contrary, high-frequency currents, such as lightning discharges, are conducted more readily by conductors of relatively high ohmic resistance but *large surface*, than by small conductors of low ohmic resistance. Marcillac secures maximum surface on the aigrettes by using flat strips instead of round rods.

The number of points on the net system is also held to be a factor contributing much to its efficacy. In addition to the aigrette points there are the barbs of the connecting conductors to the number of 12,000 or so. Perhaps the most remarkable feature of the Chenavari installation is that the earth connection has to be made in holes blasted in volcanic rock. There is no trace of the damp soil which one is accustomed to regard as essential to good earthing. One only of the earth connections is under favourable conditions, viz., the one in the small spring at the foot of the terrace. The rock does, however, contain 16 per cent. of iron (as oxide), a good deal being in the form of magnetic oxide. Doubtless this compensates to a great extent for the absence of moisture.

The successful working of the installation has been noted in a number of definite instances. The director of the Services Agricoles de l'Ardèche confirms the protective influence of the equipment, and since its erection, lightning troubles have been practically eliminated on transmission lines in the neighbourhood for several kilometres around. The Paris-Lyons-Mediterranean Railway Co. has decided to use the Marcillac system to protect certain sections of line which are to be electrified. Landowners in the neighbourhood of Chenavari assert that lightning and hailstorms are now very rare in the district, and such hail as falls is "mushy" and harmless in nature. It is true that a very heavy sleet storm was experienced last February, but as the protective equipment was then covered very thickly with rime, the incident rather supports than controverts the claim that the net is normally effective. The equipment is so cheap and simple that it should certainly be tested wherever lightning and hailstorms are prevalent.

*ELECTRICAL REVIEW, p. 275, March 9th; p. 303, March 16th, 1917.

UNDERGROUND SIGNALLING BELLS.

IN an article under this heading which appeared in the *Iron and Coal Trades Review* of July 6th, the author, Mr. L. FOKES, discusses the design of bells in accordance with the report of Dr. Wheeler and Prof. Thornton, with a view to the removal of danger due to sparking at contacts. Mr. Fokes suggests that the best method of bringing old apparatus into line with the Home Office requirements—a method which can be followed with ease and certainty of success by colliery electricians—is that of rewinding the coils with parallel windings, one of which is short-circuited. This conclusion is open to question, for reasons given below. The author appears to have been led astray by an inaccurate conception of the mode of operation of the auxiliary coil in suppressing the spark. He says:—"In a circuit containing self-induction, such as the magnet coils of an electric bell or relay, it is found that any alteration in the current or the magnetic flux which is produced by it induces an electro-motive force in the coils which always opposes the alteration, whether it is by varying a current already passing through the coils, switching the current on, or cutting it off. The value of the induced electro-motive force depends on the rate of change of magnetic flux in the circuit, and a little consideration will show that the greatest rate of change of magnetic flux occurs at switching on and switching off the apparatus. In closing the circuit no ill effects disclose themselves, but when the circuit is broken the induced electro-motive force tends to keep the current flowing after the circuit is broken at the point of contact, resulting in a spark the heat of which depends largely upon the self-induction of the circuit, but also upon the amount of current flowing in the circuit when the contact is broken."

So far all is well; but unfortunately he goes on to say that "When a bell or relay is wound with a short-circuited parallel winding, any electro-motive force induced by the varying of the magnetic flux through the circuit, as when the circuit is broken, is neutralised by another magnetic flux *which is opposed to that of the bell coils*, and is supplied by the current induced in the short-circuited winding by the vanishing magnetic flux. This has the effect of rapidly wiping out the spark when the contact is broken, and greatly reducing its temperature."

The italics are ours. What really happens is not that an opposing magnetic flux is created, but that the *original* magnetic flux is maintained in direction, and allowed to die out slowly instead of being suddenly annihilated. Hence, in the absence of a rapid change of linkage of magnetic flux with the winding of the working coil, a high E.M.F. is not induced in the latter, and the spark is reduced to insignificant proportions.

This result is attained by the creation of a current in the short-circuited coil in the same direction as that in the working coil, which, roughly speaking, grows in magnitude at the same rate as the working current falls. The sudden injection of the extremely high resistance of the gap between the contacts into the circuit of the latter causes the current to die out very rapidly, and therefore what practically happens is that, in effect, the current is almost instantaneously transferred from the working coil to the short-circuited coil, and continues to flow in the latter after the main current has completely ceased to flow; it is damped out comparatively slowly by the resistance of the coil alone, and the magnetic flux dies with it.

As a simple analogy, suppose a billiard ball moving without spin to strike a similar ball at rest on a table, fair and square; the first ball stops dead, while the second is set in motion at practically the same speed and in the same direction as the first.

This is the object to be attained. The author remarks that "if the number of effective turns for operating a bell is the same as that of its short-circuited parallel winding, then the most effective spark-reducing element is obtained," and argues that the best course is to wind the bobbin with two wires at once, one winding being afterwards short-circuited; as an objection to winding the additional coil outside an existing winding, he remarks that "very often the amount of existing winding cannot easily be determined, and also, assuming both its resistance and number of turns are known, it is not an easy matter to decide how many turns of short-circuited winding are necessary to produce the desired effect." But this statement assumes that the number of turns on both coils should be about the same; this is an error. The number of turns on the short-circuited coil is immaterial; it is the *ampere-turns* that count. A single turn will suffice, if the resistance is low enough. Hence, a stout copper tube, preferably next to the iron core, is quite satisfactory, cheaper than wire, and much more reliable; it may even be put on outside the working coil, without disturbing the latter at all, but is less effective in that position, owing to magnetic leakage.

Messrs. Wheeler and Thornton in their report pointed out that a copper sleeve gave satisfactory results. They also approved of the use of a non-inductive resistance, connected across the terminals of the working coil, as suggested by Mr. H. R. Kempe; the resistance should be five or six times that of the coil. This method is perhaps the easiest of all to apply in a hurry, and is quite effective.

The rest of Mr. Fokes's article, dealing with the precautions to be taken in winding such coils, and the method which he has found convenient for testing bells for mine-signalling, is admirable.

ELECTRIC POWER GENERATION BY GAS.

THE recent discussion upon Mr. Robertson's paper before the I.M.E.A. indicated that electrical engineers were not carried away by the present prospects of coal carbonisation in conjunction with power generation on a large scale. It is true that the results of the Glasgow experiments, quoted at the I.M.E.A. meeting by Bailie Smith, sounded distinctly encouraging, but it is the fact that the advocates of low-temperature carbonisation systems, which are those involved in the proposition, have never had a very enthusiastic public even among chemists. That fact was again demonstrated last week at the meeting of the Society of Chemical Industry, as will be seen below.

In the course of a paper on "Industrial Fuel from Gas Works," on Thursday, Mr. E. W. Smith, of the Birmingham Gas Department, severely criticised the manner in which low-temperature carbonisation experiments had been carried out hitherto. There seemed, he said, to be no general agreement as to the object of the commercial development of low-temperature carbonisation. Those who had attempted to extend the process from the laboratory stage to practical working had varied in their aims. Some had hoped for high benzol yields; others anticipated high tar yields, whilst others had as their main object the production of a solid fuel which would burn easily in the domestic grate without producing smoke. Those who had been in closest touch with many of the processes agreed that no really satisfactory results had yet been obtained. That did not mean that there was nothing in low-temperature carbonisation, but in his opinion, there had not been sufficient competent research work carried out to enable an opinion to be passed one way or the other. If one judged from the average published results, no more would be heard of the process. The recent paper by McLaurin, of Glasgow, was typical of what he meant. One of the proposals was that power stations could be put at the pit's mouth, and the gases used for generating electricity, whilst a domestic fuel would be produced. The chief advantage of that would be to centralise carbonisation and power generation, but it would decentralise domestic fuel supply. It had been overlooked that the coke produced would be very large, and that the question of freightage in distributing it to consumers would provide some difficulties. Again, if the question was examined on the basis of the figures which had, so far, been published, it would appear that the costs of washing for the light spirits for motor purposes, &c., were such as almost to neutralise the value of the increased volume of tar obtainable by low-temperature means. Taking all things into consideration, he thought there was need for the appointment of a strong Scientific Committee, versed in conditions of carbonisation, to go into the whole subject in an independent manner, in order to arrive at some definite conclusion, as far as was possible at the present time.

The PRESIDENT (Dr. Charles Carpenter), referring to the last suggestion, said it gave him some satisfaction to be able to say that the Fuel Board, which was a branch of the Research Department, had decided that the matter was so important, and that the opportunities for arriving at a definite conclusion were so unsatisfactory, that it was a matter of national importance that experiments should be made which were absolutely unimpeachable in accuracy. That was quite a broad-minded view to take, and negotiations were in a fairly forward state with regard to a site for the erection of the necessary works.

MR. DRUMMOND PATON, as one who had worked for years on the problem of low-temperature distillation, objected to the disparaging attitude taken towards the experiments upon low-temperature carbonisation by the author. Only by means of this could the millions of tons of waste coal now produced be used. The difficulty of transport of the resultant coke could be got over by briquetting, as in that form the coke could be much more expeditiously handled.

MR. SMITH, in reply, said he had no intention of casting any reflection upon the *bona fides* of the experimenters with low-temperature carbonisation. What he deprecated was that this work was the only work that had been done. It should have been carried out by men who probably had less experience in coal and more experience in research, in conjunction with the other workers.

PATENT LAW.

AT the annual meeting of the SOCIETY OF CHEMICAL INDUSTRY, in Birmingham, on Thursday, last week, DR. REE read a short paper dealing with the position of patents under present legislation. After pointing out that the compulsory working clauses of the Patent Act of 1907 were directly traceable to the efforts of the Manchester Chamber of Commerce, he drew attention to the manner in which these had been rendered very largely nugatory through the judgment of Lord Parker some 15 months later in the Hatchett case. That judgment was based largely on the argument that it was unreasonable to call on a defendant to prove or disprove the plaintiff's case, and that to do so was contrary to the principles of English justice. This reduced the compulsory working clauses to an absurdity, because it was obvious that all the patentee had to do was to refuse any information as to adequate manufacture here. The plaintiff might produce witness after witness to show that he was unaware of any manufacture in this country, but that would be no proof of non-working. As a fact, the principle of calling upon a defendant to prove or disprove what the plaintiff alleged was not contrary to the rules of English justice, and many examples could be cited in which this practice was followed. There was, for instance, the case of the trader who applied to the Railway and Canal Commissioners for a lower railway rate; the railway company was then called upon to show that the rate was a reasonable one. A receiver of stolen goods had to account for possession of the goods, and a publican had to show justification for serving a man who was drunk. In his opinion an applicant for revocation of a patent should have the same right of discovery as the applicant in a Chancery case, viz., by interrogatories.

He would like to revert to the position under the Statute of Monopolies in order to prevent Germans taking out patents in this country, preventing manufacture here, and working them abroad, thus creating a protected market in this country for the goods at our expense, fostering the foreign industry and damaging ours. It should not be enough that *part* of the invention should be worked here. The importance of insisting upon this would be apparent to all who had knowledge of what happened at the outbreak of war, when one of the difficulties was not the production of certain products, but the impossibility of obtaining certain intermediate substances. If this principle had been insisted upon years ago in regard to chemical patents, we should to-day have had an organic chemical industry rivalling that of Germany. He disputed the argument that this was primarily a matter of education; if the

Chambers of Commerce had got what they asked for years ago, there would have been plenty of suitably trained English chemists to carry on.

Either we must revert to the interpretation put upon the compulsory working clauses before Lord Parker's judgment, or to the position as it was before 1907. Compulsory licences were useless, as the patentee would always be years ahead of the licensee, to whom he would not give the latest information, because it was well known that very few patents were worked strictly in accordance with the final specification. The Germans had been fully aware of the benefits to them of the old patent law, and therefore they were the most embittered opponents of any attempts to alter it. For years and years every device was used to prevent any amendment; indeed, it was urged that if any attempt were made to do so it would lead to retaliation. At that time they had clauses in the German patent law far more stringent than those proposed in ours, and nothing happened.

MR. A. G. BLOXHAM submitted that the author was wrong in what he said with regard to retaliation on the part of the Germans, because within a very short time of the passing of the 1907 Act both Germany and Austria altered their laws, and put them on precisely the same basis as the clauses in the 1907 Act—*i.e.*, German patents in the hands of foreigners were to be revoked if the patentees worked the inventions mainly abroad.

DR. REE replied that the clauses of the German Patent Acts with regard to compulsory working were more stringent than ours, and when they were brought into line with our compulsory working clauses in the 1907 Act it really made things easier for us.

MR. J. W. HINCHLEY thought the chemical industry had reached a point at which there was an entire breakdown of the patent system. To patent a process was only to tell everyone what the patentee was doing, and from that point of view a patentee required more protection from the State without so much expense. Many inventions were made which were not patented simply because the man who worked out the process, or whatever it was, would not be protecting himself at all. He would simply be giving away what he had done. Therefore, it seemed to him that before long we must have some system of State protection quite different from our present patent law. There had been instances recently in which inventions had changed hands for quite considerable sums of money without their having been patented.

NEW PATENTS APPLIED FOR, 1917.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & CO., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

9,868. "Terminals of dynamo-electric machines, &c." HURST ELECTRIC MANUFACTURING CO. & T. H. HURST. July 9th.
9,889. "Device for protecting electric cable couplings, &c." B. R. CHURCHILL & S. P. COOK. July 9th.
9,897. "Electric buzzers." MARCONI'S WIRELESS TELEGRAPH CO. & V. A. SMART. July 9th.
9,898. "Thermionic detectors for alternating currents." W. H. GRINSTEAD AND E. A. LAIDLAW. July 9th.
9,919. "Supports for electric cables." CALLENDER'S CABLE & CONSTRUCTION CO. & J. F. WATSON. July 10th.
9,953. "Systems of electric distribution." BRITISH THOMSON-HOUSTON CO. (General Electric Co., U.S.A.). July 10th.
9,959. "Electrical coils and methods of winding same." UNIVERSAL WINDING CO. & H. WADE. July 10th.
9,960. "Electric motors." T. L. R. COOPER. July 10th.
9,962. "Telephone exchange system." WESTERN ELECTRIC CO. July 10th.
9,964. "Distributing mechanism for electric ignition systems." BOSCH MAGNETO CO. July 10th. (U.S.A., January 31st, 1916.)
9,973. "Distributing mechanism for electric ignition systems." BOSCH MAGNETO CO. July 10th. (U.S.A., February 15th, 1916.)
9,988. "Telephone receivers." J. W. HOBLEY. July 11th.
9,994. "Device for securing in the holder electrodes of electric furnaces." A. M. SPENCER & G. WAINMAN. July 11th.
10,019. "Electric hand lamps, &c." N. MCLEAN. July 11th.
10,033. "Control of electrically-operated switches." A. WEST & CO. AND W. L. WISE. July 11th.
10,052. "Electric switch." W. S. SHEPHERD. July 12th.
10,071. "Adjustable level for timing valves and ignition of rotary engines." G. W. ELLIS & J. A. JOHNSON. July 12th.
10,072. "Handling anodes in electrolytic baths for separation of metals." ELECTROLYTIC ZINC CO. (July 12th. (U.S.A., July 26th, 1916.)
10,073. "Methods of refining metallic zinc-bearing materials by electrolytic process." ELECTROLYTIC ZINC CO. July 12th. (U.S.A., July 26th, 1916.)
10,079. "Electric motor starter." N. B. COOP. July 12th.
10,096. "Magneto-electric machines." L. G. CAUNTER & F. W. SUTER. July 12th.
10,097. "Device to facilitate testing sparking plugs of magneto, &c., ignition mechanism for internal-combustion engines." L. CHAWAY. July 12th.
10,106. "Ignition magnetos for four-cylinder internal-combustion engines." H. A. LEFEVRE & R. A. PERSIN. July 12th. (France, July 12th, 1916.)
10,109. "Electrical distributors." F. L. HOLLISTER. July 12th.
10,119. "Means for production of high-voltage discharges." CREED & CO. AND N. F. S. HECHT. July 12th.
10,113. "Electrodes for use in electrolytic gas generators, &c." I. H. LEVIN. July 13th. (U.S.A., December 20th, 1915.)
10,129. "Electric batteries." S. S. BIRD & EDISON SWAN ELECTRIC CO. July 12th.
10,153. "Indicating devices for electric fuses." C. D. FRASER. July 13th.
10,160. "Electric welding machines." H. R. WOODROW. July 13th. (U.S.A., October 23rd, 1916.)
10,162. "Mine signalling apparatus." J. MILLIGAN. July 13th.
10,163. "Call distributing systems." L. POLINKOWSKY & WESTERN ELECTRIC CO. July 13th.
10,164. "Machine switching telephone systems." L. POLINKOWSKY AND WESTERN ELECTRIC CO. July 13th.
10,178. "Dry batteries." E. ARMELIN. July 13th.
10,180. "Ignition magnetos." J. H. CHAMBERS & H. LUCAS. July 13th.
10,182. "Blow-out spark dischargers for impulse excitation and for high spark frequency." A. KOWALSKI. July 13th. (Switzerland, June 2nd.)
10,187. "Dynamo-electric machines." REMY ELECTRIC CO. July 13th. (U.S.A., December 19th, 1916.)
10,191. "Electric valves." G. GILES. July 13th.
10,211. "Aerial electric dispatch or transmission apparatus." J. G. H. BROOK. July 14th.
10,213. "Ventilation and cooling of dynamo-electric machines." C. W. MAJOR. July 14th.
10,220. "Sparking plugs." R. HENRY & E. HERRMANN. July 14th. (France, July 27th, 1916.)

PUBLISHED SPECIFICATIONS.

1916.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

5,586. ELECTRIC JUNCTION BOXES. W. A. Sutton. April 17th, 1916. (107,210.)
7,121. DYNAMO-ELECTRIC GENERATORS AND SYSTEMS CONNECTED THEREWITH. J. Stone & Co. and A. H. Darker. (107,216.)
8,639. ARRANGEMENT OF ELECTRIC STORAGE BATTERIES IN SUBMARINES AND CONSTRUCTION OF SUBMARINES FOR THAT PURPOSE. E. C. R. Marks (Soc. Anon. Italiana G. Ansaldo & Co.). June 19th, 1916. (107,233.)
8,691. TELEPHONE SYSTEMS. Relay Automatic Telephone Co., H. J. Herink and O. Grahn. June 20th, 1916. (107,236.)
8,756. CONTROL OF ALTERNATING ELECTRIC CURRENT INDUCTION MOTORS. W. Brooke. June 21st, 1916. (107,240.)
8,796. METHODS OF AND MEANS FOR CONTROLLING ELECTRIC MOTORS. British Thomson-Houston Co. (General Electric Co., U.S.A.). June 22nd, 1916. (107,242.)
8,902. IGNITION PLUGS FOR INTERNAL-COMBUSTION ENGINES. J. A. Kennedy McGregor & E. H. Hodgkinson. June 24th, 1916. (107,248.)
9,050. SPARKING PLUGS. C. H. Watkins. June 27th, 1916. (107,254.)
9,180. JOINTS FOR ELECTRICAL CONDUCTORS. C. Vernier. June 29th, 1916. (107,258.)
9,185. ELECTRICAL SWITCHES. J. W. Treherne. June 29th, 1916. (107,259.)
9,203. APPARATUS FOR THE LIGHTING AND/OR HEATING OF MOTOR ROAD VEHICLES, TRAINS, AND THE LIKE. W. F. W. Rhodes & J. Firth. June 30th, 1916. (107,260.)
9,646. ELECTRIC SWITCHES. G. Ellison & A. Anderson. July 8th, 1916. (107,268.)
9,885. ELECTRIC TORCHES. H. Goldsmith. July 13th, 1916. (107,270.)
9,938. PROTECTION OF ELECTRIC TRANSMISSION SYSTEMS. British Thomson-Houston Co. (General Electric Co., U.S.A.). July 14th, 1916. (107,272.)
10,088. COMBINED ELECTRIC SWITCHES AND COUPLINGS. A. E. Read, J. E. Franks & M. Brooks. July 18th, 1916. (107,275.)
10,126. SPARKING PLUGS FOR INTERNAL-COMBUSTION ENGINES. G. St. B. S. Watkins. July 18th, 1916. (107,277.)
11,064. MAGNETIC SEPARATORS. O. S. Jones. August 5th, 1916. (Cognate application, 15,643/16.) (107,284.)
11,428. ELECTRO-MAGNETIC SWITCHES. British Thomson-Houston Co. (General Electric Co., U.S.A.). August 12th, 1916. (107,289.)
17,271. ELECTRIC SWITCHES. L. J. Norton. December 1st, 1916. (107,336.)
18,257. ELECTRIC SWITCHES, MORE PARTICULARLY FOR USE IN CONNECTION WITH SWITCHBOARDS. A. H. Midgley and C. A. Vandervell & Co. December 20th, 1916. (107,340.)
2,785. ELECTRIC LIFT SYSTEM. Waygood-Otis, Ltd. (Otis Elevator Co., U.S.A.). February 26th, 1917. (107,356.)
4,946. CIRCUIT INTERRUPTORS. British Westinghouse Electric & Manufacturing Co. (Westinghouse Electric & Manufacturing Co., U.S.A.). April 5th, 1917. (107,361.)
3,868. METHOD OF MANUFACTURING PERMANENTLY FUSIBLE AND SOLUBLE SYNTHETIC RESINS FROM NON-FUSIBLE PHENOLALDEHYDE RESINS. L. Berend. March 15th, 1916. (107,205.)
5,213. INDICATORS FOR TRAMCARS AND THE LIKE FOR INDICATING STATIONS OR STOPPING POINTS. C. W. Mallins. April 10th, 1916. (107,024.)
6,939. GYROSCOPIC COMPASSES. H. L. Tanner. May 15th, 1915. (100,490.)
10,037. PORTABLE DUST-SUCTION APPARATUS. R. Haddan (Elektromekaniska Aktiebolaget). July 17th, 1916. (Convention date not granted.) (100,953.)
13,931. ADVERTISING DEVICES. H. Fairbrother (Mystic Advertising Device). September 30th, 1916. (107,136.)

1917.

52. APPARATUS FOR RECORDING CO-RELATED LIGHT AND SOUND VARIATIONS. W. B. Vansize. Jan. 7th, 1917. (107,167.)

Irish Peat Deposits.—The Fuel Research Board, with the sanction of the Committee of the Privy Council for Scientific and Industrial Research, has appointed a Committee of Inquiry into the utilisation of Irish peat deposits. The terms of reference to the Committee are as follows:—

"To inquire into and to consider the experience already gained in Ireland in respect of the winning, preparation, and use of peat for fuel and for other purposes, and to suggest what means shall be taken to ascertain the conditions under which, in the most favourably situated localities, it can be profitably won, prepared, and used, having regard to the economic conditions of Ireland; and to report to the Fuel Research Board."

Though the inquiries of the Committee will ultimately lead up to the consideration of peat as a source of energy in central power stations, there are sound reasons why this aspect of the problem should be postponed to a later stage. On the one hand, the Fuel Research Board is already organising an extensive inquiry into the problems of fuel economy in connection with power production, and the results of this inquiry will supply the fundamental data and information which will be required when the time comes for the consideration of any wide scheme of development in Ireland. On the other hand, any schemes of development must be based on a more exact knowledge than is at present available regarding the selection of the more favourably situated bogs and the possibilities of winning and transporting partially dried peat to centres at which it may be converted into marketable products. It is obvious, therefore, that the inquiries of the Committee are likely to be most fruitful if they are concentrated on the fundamental problems, for until these are settled no satisfactory progress can be made.

The following appointments have been made to the Committee:—Sir John Purser Griffith (chairman); Prof. Hugh Ryan, Prof. Sydney Young, Mr. George Fletcher, Prof. Pierce Purcell (secretary).

All communications should be addressed to the Secretary, the Peat Inquiry Committee, University College, Dublin.